

**DIVISION 300. SUBGRADES, SUBBASES, AND BASE COURSES**

**SUBGRADE**

**SECTION 301. SUBGRADE PREPARATION**

**301.01 Description.** This work shall consist of preparing the completed or existing earthwork as an unimproved subgrade prior to constructing the pavement structure, shoulders, or appurtenances.

**301.02 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Steel Wheel Roller .....	1101.01
(b) Tamping Roller .....	1101.01
(c) Pneumatic-Tired Roller .....	1101.01
(d) Subgrade Planer.....	1103.08
(e) Subgrade Machine.....	1103.09

**CONSTRUCTION REQUIREMENTS**

**301.03 General.** When the contract includes rough grading and surfacing, the rough grading shall be completed as far in advance of the construction of the surfacing as feasible.

When the rough grading has been included in a previous contract, all vegetation shall be removed prior to preparing the subgrade.

The subgrade shall be prepared such that after compaction, it will be smooth and conform to the alignment, grades, and cross sections shown on the plans.

Surplus excavated material resulting from grading and shaping the subgrade shall be disposed of according to Article 202.03. When additional material is required, it shall be obtained from within the right-of-way when possible and approved by the Engineer. Placement shall be according to Articles 205.04 and 205.05.

**301.04 Subgrade Compaction and Stability.** When compacted, the subgrade shall have a minimum dry density of 95 percent of the standard laboratory dry density and a minimum immediate bearing value (IBV) of 8.0. Densities will be determined according to Article 205.06. The IBV will be determined according to Illinois Test Procedure 501 or 502.

In cut sections, the Contractor shall take the following steps in an effort to obtain the required density and stability.

- (a) Step 1. Cut plan ditches, which drain the area, at least to grade. This shall be done at least two weeks prior to Step 2.

- (b) Step 2. Air dry the top 8 in. (200 mm) of subgrade. This procedure shall include at least two 8 in. (200 mm) deep processings utilizing disks or tillers each day for three consecutive good drying days.
- (c) Step 3. Recompact the layer processed in Step 2 to achieve the required density, or until at least nine passes of a roller which has demonstrated ability to obtain the density on adjacent earth work have been made.

When the above steps have been performed and the required density and stability still have not been attained, the Engineer will make a determination as to whether additional drying and recompaction will be needed or whether the ground and soil conditions warrant more extensive treatments. Soft and unstable material that will not compact when rolled or tamped, shall be removed and disposed of according to Article 202.03, and replaced with material approved by the Engineer according to Articles 205.04 and 205.05.

Where rolling of the subgrade is required, any areas which are inaccessible to a roller shall be compacted by either a mechanical or hand tamper meeting the approval of the Engineer.

Equipment of such weight, or used in such a way as to cause a rut in the finished subgrade of 1/2 in. (13 mm) or more in depth, shall be removed from the work or the rutting otherwise prevented.

The subgrade will be approved by the Engineer before construction of the pavement structure, shoulders, or appurtenances is started.

**301.05 Aggregate Base Course and Aggregate Surface Course, Type A.**

The subgrade shall be compacted by rolling with a steel wheel or pneumatic-tired roller. The rolling shall extend at least 12 in. (300 mm) beyond each edge of the proposed base course.

**301.06 Aggregate Surface Course, Type B.** The subgrade will not have to be rolled prior to placement of the aggregate surface course, Type B.

**301.07 Hot-Mix Asphalt (HMA) Base Course and Pavement (Full-Depth) and Portland Cement Concrete Base Course and Pavement.** The work shall be extended to at least 18 in. (450 mm) beyond each edge of the proposed base course or pavement. When a subbase is being placed under the base course or pavement, the work shall be extended to include the area being covered by the subbase material.

Prior to final shaping, the subgrade shall be compacted with a steel wheel or pneumatic-tired roller. Steel wheel rollers shall weigh from 6 to 10 tons (5.5 to 9 metric tons) total and from 200 to 325 lb/in. (35 to 57 N/mm) of roller width.

The subgrade shall be brought to true shape by means of a subgrade planer and/or subgrade machine according to the following.

- (a) Either the subgrade planer or the subgrade machine shall be used when:

(1) Portland cement concrete pavement or base course is constructed on the subgrade or subbase using forms.

(2) HMA base course is constructed.

(b) The subgrade machine shall be used when:

(1) Portland cement concrete pavement or base course is constructed on the subgrade or subbase using the slip form method.

(2) Continuously reinforced portland cement concrete pavement is constructed on the subbase or subgrade.

(3) HMA pavement (full-depth) is constructed.

When portland cement concrete is being placed directly on the subgrade, the subgrade shall be moist, but not muddy, at the time of placing the concrete. If required by the Engineer, the prepared subgrade shall be saturated with water the previous night, or not less than six nor more than 20 hours prior to the placing of the concrete. If the subgrade subsequently becomes too dry, it shall be sprinkled again ahead of placing the concrete, in such a manner as not to form mud or puddles of water.

The Contractor shall have at all times a minimum of one day's production of subgrade prepared ahead of the location at which the base course or pavement is being placed.

**301.08 Gutters, Curbs, and Combination Curb and Gutter.** The subgrade shall be compacted and finished to a firm, smooth surface in a manner approved by the Engineer.

**301.09 Drainage.** The subgrade shall be kept drained during the construction of the pavement structure. If earth berms are deposited along the edge of the subgrade, provision shall be made for surface drainage by cutting lateral ditches through the berms.

**301.10 Maintenance.** The prepared subgrade shall be maintained in a smooth and compacted condition.

**301.11 Method of Measurement.** When the contract includes both grading and paving, this work will not be measured for payment.

When the contract includes paving on a pregraded section, this work will be measured for payment as follows.

(a) Contract Quantities. The requirements for the use of contract quantities shall be according to Article 202.07(a).

(b) Measured Quantities. Subgrade preparation will be measured for payment in units of 100 ft (30 m) in horizontal distances along baselines. No allowance will be made for variable width roadways. No allowance will be made for excavation for removal or placement of any material within 2 in.

(50 mm) of the grade and cross section shown on the plans or established by the Engineer

**301.12 Basis of Payment.** When the contract includes paving on a pregraded section, this work will be paid for at the contract unit price per unit for SHAPING AND GRADING ROADWAY.

Excavation for the removal or placement of material outside the 2 in. (50 mm) tolerance specified in Article 301.11(b) will be paid for according to Article 109.04.

Additional drying and compaction beyond the three steps listed in Article 301.04 will be paid for according to Article 109.04.

Excavation and replacement of soft and unstable material, as specified in Article 301.04, will be classified and paid for according to Article 104.02.

## SECTION 302. SOIL MODIFICATION

**302.01 Description.** This work shall consist of constructing a modified soil layer composed of soil, water, and a modifier.

**302.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Type I Portland Cement .....	1001
(b) Type I (SM) Slag-Modified Portland Cement .....	1001
(c) Water .....	1002
(d) Hydrated Lime .....	1012.01
(e) By-Product, Hydrated Lime .....	1012.02
(f) By-Product, Non-Hydrated Lime .....	1012.03
(g) Lime Slurry .....	1012.04
(h) Fly Ash .....	1010
(i) Soil for Soil Modification (Note 1) .....	1009.01
(j) Bituminous Materials (Note 2) .....	1032

Note 1. This soil requirement only applies when modifying with lime (slurry or dry).

Note 2. The bituminous materials used for curing shall be emulsified asphalt RS-2, CRS-2, HFE 90, or HFE 150; rapid curing liquid asphalt RC-70; or medium curing liquid asphalt MC-70 or MC-250.

**302.03 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Distributor (Note 1)	
(b) Rotary Speed Mixer .....	1101.06
(c) Disk Harrow (Note 2) .....	1101.02
(d) Lime Slurry Equipment (Note 3)	

Note 1. The distributor shall be a mechanical type and shall be approved by the Engineer.

Note 2. A disk harrow may be used for soil modification with portland cement, slag-modified portland cement, or lime (slurry or dry) when permitted by the Engineer.

Note 3. The equipment used for mixing, transporting, slaking, and placing lime slurry shall be approved by the Engineer.

## CONSTRUCTION REQUIREMENTS

**302.04 General.** The modified soil shall be constructed when the temperature of the soil, measured 6 in. (150 mm) below the surface is above 50 °F (10 °C) and the ambient air temperature in the shade is above 45 °F (7 °C).

The quantity of modified soil constructed shall be limited to that which can be covered by the pavement during the same construction season.

**302.05 Proportioning.** Proportioning shall be as follows.

- (a) **Samples.** Samples of the soil modifier(s) and the project soil(s) shall be obtained and submitted to the Engineer at least 45 days prior to the construction of the modified soil. Sample sizes shall be a minimum of 25 lb (11 kg) for the modifier(s) and 200 lb (90 kg) for the project soil(s).
- (b) **Mix Design.** The actual proportions of modifier, soil, and water will be determined by the Engineer prior to construction using the submitted samples. The Engineer reserves the right to make such adjustments in proportions as are considered necessary during the progress of the work.

In no case shall proportions or type of modifier be changed during the progress of the work without permission from the Engineer.

**302.06 Preparation of Subgrade.** The area to be processed shall be shaped to the proper grade and cross section. All vegetation and other objectionable material shall be removed from within the limits of modification. In cut or at grade sections, the subgrade shall be prepared according to Articles 301.03 and 301.04; except the minimum immediate bearing value (IBV) of the soil below the soil to be modified, shall be according to the Department's "Subgrade Stability Manual".

**302.07 Application of Modifier.** The modifier shall be applied uniformly on the soil. The application of modifier shall be limited to that amount which can be incorporated into the soil within the same working day.

After application of dry modifiers, but before the addition of any water, the surface of the subgrade shall be lightly scarified or disked. When lime slurry is used, the surface of the subgrade shall be lightly scarified or disked prior to the application of the slurry.

Dry modifiers shall not be applied when wind conditions are such that blowing modifier becomes objectionable to adjacent property owners or creates a hazard to traffic on adjacent highways, as determined by the Engineer.

Lime slurry shall be applied within 30 days of preparing and mixing the slurry, and shall be thoroughly agitated prior to application.

Modifier which has been damaged by hydration due to rain prior to or during the mixing operations, or has been displaced by the Contractor's equipment or other traffic after application, shall be replaced.

**302.08 Mixing.** The modifier, soil, and water shall be thoroughly mixed. Mixing shall continue until a homogenous layer of the required thickness has been obtained and a minimum of 75 percent of the mixture is smaller than 1 in. (25 mm). The moisture content of the modified soil shall be between optimum and three percent above optimum.

For soil modification with fly ash, more than one pass of the rotary speed mixer may be necessary to obtain a homogenous mixture. If more than one pass of the rotary speed mixer is required, the application of the fly ash shall be modified such that 25 percent of the specified fly ash quantity is applied and mixed with a down-cut motion as a preparation for the final pass of the rotary speed mixer. The remaining specified quantity of fly ash shall be applied prior to the final pass of the rotary speed mixer. Mixing shall continue until a minimum 75 percent of the mixture is smaller than 1 in. (25 mm).

**302.09 Compaction.** Compaction of soil modified with portland cement, slag-modified portland cement, or fly ash shall be completed no later than one hour after mixing begins.

Compaction of soil modified with hydrated lime or by-product non-hydrated lime shall be completed within the same day.

Compaction of soil modified with lime slurry shall begin within 24 hours.

Compaction of soil modified with by-product hydrated lime shall be delayed a minimum of 24 hours. The Engineer may require additional water or further mixing prior to the final compaction of soil modified with by-product hydrated lime. In no case shall compaction be started later than three days after mixing, unless approved by the Engineer. If compaction is to be delayed, the surface of the soil shall be crown-graded and sealed from moisture loss by either blade dragging or light rolling immediately after mixing.

The compacted, modified soil shall have a minimum dry density of 95 percent of the laboratory standard dry density. The in-place dry density will be determined according to AASHTO T 191, or Illinois Modified AASHTO T 310 (Direct Transmission Density/Backscatter Moisture). The laboratory standard dry density will be determined according to AASHTO T 99.

**302.10 Finishing and Curing.** When multiple lifts are used to construct the modified soil layer, the top lift shall be a minimum of 6 in. (150 mm) thick when compacted.

When compaction of the modified soil is nearing completion, the surface shall be shaped to the required lines, grades, and cross section shown on the plans. For HMA base course and pavement (full-depth) and portland cement concrete base course and pavement, the surface of the modified soil shall be brought to true shape and correct elevation according to Article 301.07, except well compacted earth shall not be used to fill low areas.

The modified soil shall be cured for a minimum of 24 hours. The ambient air temperature shall be above 45 °F (7 °C) during curing.

Soils modified with lime (slurry or dry) generally will not require curing unless the minimum stability requirements in Article 302.11 cannot be met. If it has been determined by the Engineer that curing is necessary, it shall be performed as stated herein.

During the curing period, the moisture content of the modified soil shall be maintained at optimum by sprinkling with water, use of plastic sheeting, or applying bituminous materials according to Article 312.14. During this period, no equipment or traffic will be permitted on the completed work beyond that required for maintenance of curing.

Equipment of such weight, or used in such a way as to cause a rut depth of 1/2 in. (13 mm) or more in the finished modified soil, shall be removed, or the rutting otherwise prevented, as directed by the Engineer.

**302.11 Subgrade Stability.** Following curing, the Engineer will determine the stability of the modified soil in terms of the immediate bearing value (IBV), according to Illinois Test Procedure 501. The IBV shall be a minimum of 10.0.

No equipment or traffic shall be on the modified soil after compaction until the required IBV is attained.

**302.12 Method of Measurement.** This work will be measured for payment as follows.

- (a) Contract Quantities. The requirements for the use of contract quantities shall conform to Article 202.07(a).
- (b) Measured Quantities. Processing modified soils will be measured for payment in place and the area computed in square yards (square meters). The width for measurement will be as shown on the plans.

Modifier will be measured for payment in tons (metric tons). The modifier will be measured in trucks or freight cars. The Contractor shall furnish or arrange for use of scales of a type approved by the Engineer. When the modifier is shipped in trucks, it will be measured at the place of loading, at the place of unloading, or at such other place as the Engineer may designate. The Engineer may accept original signed freight bills in lieu of determining the weight (mass).

Should the Contractor's method of construction require extra earth excavation or embankment due to requiring more than one lift to construct the modified soil layer as shown on the plans, this extra earth excavation and embankment will not be measured for payment.

**302.13 Basis of Payment.** This work will be paid for at the contract unit price per square yard (square meter) for PROCESSING MODIFIED SOIL, of the thickness specified and per ton (metric ton) for LIME, FLY ASH, PORTLAND CEMENT, or SLAG-MODIFIED PORTLAND CEMENT.

**SUBBASE**

**SECTION 310. LIME STABILIZED SOIL MIXTURE**

**310.01 Description.** This work shall consist of the construction of a lime stabilized soil mixture, composed of soil, lime, and water which shall be considered as subbase.

**310.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Water .....	1002
(b) Hydrated Lime .....	1012.01
(c) By-Product, Non-Hydrated Lime .....	1012.03
(d) Lime Slurry .....	1012.04
(e) Soil for Lime Stabilization .....	1009.02
(f) Bituminous Materials (Note 1) .....	1032

Note 1. The bituminous materials used for curing shall be emulsified asphalt RS-2, CRS-2, HFE 90, or HFE 150; rapid curing liquid asphalt RC-70; or medium curing liquid asphalt MC-70 or MC-250.

**310.03 Equipment.** Equipment shall be according to Article 302.03, except a disk harrow may be used when permitted by the Engineer.

**CONSTRUCTION REQUIREMENTS**

**310.04 General.** The lime stabilized soil mixture shall be constructed when the temperature of the soil measured 6 in. (150 mm) below the surface is above 50 °F (10 °C) and the ambient air temperature in the shade is above 45 °F (7 °C).

The quantity of lime stabilized soil mixture constructed shall be limited to that which can be covered by the pavement during the same construction season.

**310.05 Proportioning.** Proportioning shall be as follows.

- (a) Samples. Samples of the lime and the project soil(s) shall be obtained and submitted to the Engineer at least 45 days prior to the construction of the



lime stabilized soil mixture. Sample sizes shall be a minimum of 25 lb (11 kg) for the lime and 200 lb (90 kg) for the project soil(s).

- (b) **Mix Design.** The actual proportions of lime, soil, and water will be determined by the Engineer prior to construction using the submitted samples. The Engineer reserves the right to make such adjustments in proportions as are considered necessary during the progress of the work.

In no case shall proportions or type of lime be changed during the progress of the work without permission from the Engineer.

**310.06 Preparation of Subgrade.** The area to be processed shall be shaped to the proper grade and cross section. All vegetation and other objectionable material shall be removed from within the limits of lime treatment. In cut or at grade sections, the subgrade shall be prepared according to Articles 301.03 and 301.04; except the minimum immediate bearing value (IBV) of the soil below the soil to be stabilized, shall be 3.0.

**310.07 Application of Lime.** The lime (slurry or dry) shall be applied uniformly on the soil. The application of lime shall be limited to that area where the initial mixing operations can be completed during the same working day.

After application of dry lime, but before the addition of any water, the surface of the subgrade shall be lightly scarified or disked. When lime slurry is used, the surface of the subgrade shall be lightly scarified or disked prior to the application of the slurry.

Dry lime shall not be applied when wind conditions are such that blowing lime becomes objectionable to adjacent property owners or creates a hazard to traffic on adjacent highways, as determined by the Engineer.

Lime slurry shall be applied within 30 days of preparing and mixing the slurry, and shall be thoroughly agitated prior to application.

Lime (slurry or dry) that has been exposed to the open air for a period of six hours or more shall be replaced. Lime (slurry or dry) which has been damaged by hydration due to rain prior to or during the mixing operations, or has been displaced by the Contractor's equipment or other traffic after application, shall be replaced.

**310.08 Mixing.** Mixing shall be performed in two stages as follows.

- (a) **Initial Mixing.** The lime, soil, and water shall be thoroughly mixed until a uniform mixture throughout the required depth and width is obtained. All clods and lumps shall be reduced to a maximum size of 2 in. (50 mm). The moisture content of the stabilized soil shall be between optimum and three percent above optimum.

After mixing, the surface shall be sealed with a light rolling. The mixture shall then be left to undergo a conditioning period of at least 48 hours. The mixture shall be maintained in a moist condition throughout the entire conditioning period.

- (b) **Final Mixing.** After the required conditioning period, the mixture shall be uniformly mixed and maintained at approximately optimum moisture content. If the mixture contains clods, they shall be pulverized to meet the following requirements.

Sieve Size	Minimum % Passing
1 in. (25 mm)	100
No. 4 (4.75 mm)	60

Mixing may be performed in a single stage when permitted by the Engineer, provided that the final mixing requirements are met.

**310.09 Compaction.** After final mixing, compaction shall be completed within the same day.

The compacted, lime stabilized soil mixture shall have a minimum dry density of 95 percent of the laboratory standard dry density. The in-place dry density will be determined according to AASHTO T 191, or Illinois Modified AASHTO T 310 (Direct Transmission Density/Backscatter Moisture). The laboratory standard dry density will be determined according to AASHTO T 99.

**310.10 Finishing and Curing.** When compaction of the lime stabilized soil mixture is nearing completion, the surface shall be shaped to the required lines, grades, and cross section shown on the plans. For HMA base course and pavement (full-depth) and portland cement concrete base course and pavement, the surface of the lime stabilized soil mixture shall be brought to true shape and correct elevation according to Article 301.07, except that well compacted earth shall not be used to fill low areas. The surface shall be maintained in a moist condition by means of a fine spray during all finishing operations.

The lime stabilized soil mixture shall be cured for a period of seven days and maintained at optimum moisture content by sprinkling with water or applying bituminous materials according to Article 312.14. During this period, no equipment or traffic will be permitted on the completed work beyond that required for maintenance of curing.

**310.11 Subgrade Stability.** Following curing, the Engineer will determine the stability of the lime stabilized soil mixture in terms of the immediate bearing value (IBV) according to Illinois Test Procedure 501. The IBV shall be a minimum of 23.0.

No equipment or traffic shall be on the lime stabilized soil mixture after compaction until the required IBV is attained.

**310.12 Construction Joints.** Construction joints will not be required between each day's work, unless there is a time lapse of seven days or more between the processing of adjacent sections. When construction joints are required, they shall be formed by cutting back 3 ft (1 m) into the completed work to form a vertical face. Otherwise, damage to completed work shall be avoided.

**310.13 Maintenance.** The lime stabilized soil mixture shall be maintained in a manner satisfactory to the Engineer. Maintenance shall include immediate repairs of any defective or damaged portions.

**310.14 Method of Measurement.** This work will be measured for payment as follows.

- (a) **Contract Quantities.** The requirements for the use of contract quantities shall conform to Article 202.07(a).
- (b) **Measured Quantities.** Processing lime stabilized soil mixture will be measured for payment in place and the area computed in square yards (square meters). The width of measurement will be as shown on the plans.

Lime will be measured for payment in tons (metric tons). The lime will be measured in trucks or freight cars. The Contractor shall furnish or arrange for use of scales of a type approved by the Engineer. When the lime is shipped in trucks, it will be measured at the place of loading, at the place of unloading, or at such other place as the Engineer may designate. The Engineer may accept original signed freight bills in lieu of determining the weight (mass).

Should the Contractor's method of construction require additional earth excavation or embankment due to requiring more than one lift to construct the lime stabilized soil mixture as shown on the plans, this extra earth excavation and embankment will not be measured for payment.

**310.15 Basis of Payment.** This work will be paid for at the contract unit price per square yard (square meter) for PROCESSING LIME STABILIZED SOIL MIXTURE, of the thickness specified; and per ton (metric ton) for LIME.

**SECTION 311. GRANULAR SUBBASE**

**311.01 Description.** This work shall consist of furnishing, placing, and compacting granular material on the prepared subgrade as shown on the plans.

**311.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate .....	1004.04

**311.03 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Steel Wheel Rollers .....	1101.01(e)
(b) Pneumatic-Tired Rollers .....	1101.01
(c) Vibratory Machine (Note 1)	
(d) Subgrade Planer .....	1103.08
(e) Subgrade Machine .....	1103.09

Note 1. The vibratory machine shall meet the approval of the Engineer.

## CONSTRUCTION REQUIREMENTS

**311.04 Subgrade.** The subgrade shall be prepared according to Section 301, except Articles 301.05 and 301.06 will not apply.

**311.05 Placing and Compacting Subbase Materials.** The granular material shall be placed and compacted as specified for the particular type of granular subbase. If any earth is worked into the granular material during the compacting or finishing operations, all granular material within the affected area shall be removed and replaced with new granular material. The Engineer may restrict hauling over the completed or partially completed work after inclement weather or at any time when the earth subgrade is soft and there is a tendency for the earth to work into the granular material.

The granular material shall be placed and compacted at least three days prior to the placement of pavement or base course.

If the moisture content is insufficient to maintain satisfactory compaction or to prevent segregation or raveling when hauling is permitted over the granular material, water shall be added as directed by the Engineer.

When construction of the granular subbase has been completed at a location, or when directed by the Engineer, the Contractor shall salvage the excess granular material outside the construction limits of the granular subbase. The salvaged granular material shall be carried forward and utilized in the construction of the granular subbase. The Contractor shall salvage the granular material in such a manner as to prevent segregation and the incorporation of earth.

Placing and compacting of the different subbase granular material types shall be as follows.

- (a) Subbase Granular Material, Type A. The granular material shall be uniform in gradation. Before the material is deposited on the roadway, it shall contain the amount of moisture required for compaction. The amount of moisture required shall be that determined by the Engineer for the material and the compaction methods being used. The water and granular material shall be mixed through a controlled aggregate mixing system. The system shall consist of a mechanical mixing device and aggregate and water measuring devices meeting the approval of the Engineer. Wetting the aggregate by jetting in cars, bins, stockpiles, or trucks will not be permitted. Moisture shall be added to the material during compaction only when it is necessary to increase the percentage of moisture to obtain satisfactory compaction.

The subbase shall be constructed in lifts not more than 4 in. (100 mm) thick when compacted, except that if tests indicate that the desired results are being obtained, the compacted thickness of any lift may be increased to a maximum of 8 in. (200 mm).

The granular material shall be deposited full-lane width with a mechanical spreader or spreader box of a type approved by the Engineer, in a manner that shall not cause segregation and that shall require minimum blading or manipulation. The equipment and the method used shall be approved by the Engineer.

Each lift shall be compacted immediately after placing. The granular material shall be compacted to not less than 95 percent of the standard laboratory density.

The standard laboratory density shall be the maximum dry density determined according to AASHTO T 99 (Method C). A coarse particle correction according to AASHTO T 224 shall be used.

The dry density of the compacted subbase will be determined by the Engineer at regular intervals according to AASHTO T 191, Illinois Modified AASHTO T 310 (Direct Transmission Density/Backscatter Moisture), or by other methods approved by the Engineer.

(b) Subbase Granular Material, Type B. The subbase shall be constructed in lifts not more than 6 in. (150 mm) thick when compacted, except that if tests indicate that the desired results are being obtained, the compacted thickness of any lift may be increased to a maximum of 8 in. (200 mm). Each lift of material shall be compacted in a manner approved by the Engineer. If the moisture content of the material is such that compaction satisfactory to the Engineer cannot be obtained, sufficient water shall be added so that satisfactory compaction can be obtained.

(c) Subbase Granular Material, Type C. The subbase shall be compacted to the satisfaction of the Engineer. The manner of placing and compacting the material shall be approved by the Engineer prior to starting this work.

**311.06 Finishing of Subbase for Base Course and Pavement.** The subbase shall be brought to true shape according to Article 301.07, except for the following.

The compacted subbase shall be placed above the plan elevation and the excess trimmed or cut with the subgrade machine. The Contractor shall determine the amount of excess subbase material necessary to meet this requirement.

After the subbase has been brought to its true shape and correct elevation, the surface shall be wetted and rolled as directed by the Engineer with a steel wheel roller meeting the weight requirements specified in Article 301.07. The surface of the subbase shall then be tested for crown and elevation.

The Contractor shall have at all times a minimum of one day's production of subbase prepared ahead of the paving.

When portland cement concrete base course or pavement is being placed, the subbase shall be moist at the time of placement. If required by the Engineer, the prepared subbase shall be saturated with water the previous night, or not less than six nor more than 20 hours prior to the placing of the concrete. If the subbase

subsequently becomes too dry, it shall be sprinkled again ahead of placing the concrete, in such a manner as not to form puddles of water.

**311.07 Tolerance in Thickness.** The subbase shall be constructed to the thickness shown on the plans. Thickness determinations shall be made at such points as the Engineer may select. When the constructed thickness is less than 90 percent of the thickness shown on the plans, aggregate shall be added to obtain the specified thickness; however, the surface elevation of the completed subbase shall not exceed by more than 3/16 in. (5 mm) the surface elevation shown on the plans or authorized by the Engineer.

**311.08 Method of Measurement.** This work will be measured for payment as follows.

- (a) Contract Quantities. The requirements for the use of contract quantities shall conform to Article 202.07(a).
- (b) Measured Quantities. Granular subbase will be measured for payment in tons (metric tons), cubic yards (cubic meters), or square yards (square meters).

When the unit of measurement for the aggregate is tons (metric tons), the aggregate may be weighed in trucks or freight cars. The Contractor shall furnish or arrange for the use of scales of a type approved by the Engineer. If, at the time the Type A aggregate is weighed, it contains more than six percent of absorbed and free moisture by weight, a deduction for the amount of moisture in excess of this amount will be made in determining the pay quantity. Any aggregate that has been stockpiled will be weighed at the time it is incorporated into the work.

If the material is shipped in trucks, it may be weighed at the place of loading, at the place of unloading, or at such other place as the Engineer may designate. If the material is shipped in freight cars, the Engineer will accept the freight car weights, instead of scale weights, provided the Engineer is satisfied that the car weights are sufficiently accurate. In order to verify the car weights, the Contractor will be required to weigh the contents of at least ten percent of the freight cars received each day, with a minimum of one car weight each day, over truck scales. If the truck weights do not verify the freight car weights, additional cars shall be weighed. In addition to this verification, the Contractor will be required to weigh the contents of any freight car that appears deficient in material. The Contractor shall furnish the original signed freight bill for each car.

When the unit of measurement for the aggregate is tons (metric tons), payment will not be made for aggregate in excess of 108 percent of the amount specified by the Engineer nor for aggregate placed outside the design width plus 6 in. (150 mm).

When the unit of measurement for the aggregate is cubic yards (cubic meters), the aggregate will be measured in place and the volume computed in cubic yards (cubic meters). The width and depth for measurement will be as shown on the plans.

When the unit of measurement for the aggregate is square yards (square meters), the aggregate will be measured in place and the area computed in square yards (square meters). The width for measurement will be as shown on the plans.

If the granular material removed during the subgrading operation is not carried forward and incorporated in the granular subbase, a deduction will be made for the quantity not salvaged, except that no deduction will be made where the quantity not salvaged is less than 2 cu yd/station (5 cu m/100 m) or where cubic yards (cubic meters) or square yards (square meters) is the basis of payment.

**311.09 Basis of Payment.** Subbase Granular Material, Type A, Subbase Granular Material, Type B, and Subbase Granular Material, Type C will be paid for at the contract unit price per ton (metric ton) for SUBBASE GRANULAR MATERIAL, TYPE A, SUBBASE GRANULAR MATERIAL, TYPE B, or SUBBASE GRANULAR MATERIAL, TYPE C; at the contract unit price per cubic yard (cubic meter) for SUBBASE GRANULAR MATERIAL, TYPE A, SUBBASE GRANULAR MATERIAL, TYPE B or SUBBASE GRANULAR MATERIAL, TYPE C; or at the contract unit price per square yard (square meter) of the thickness specified for SUBBASE GRANULAR MATERIAL, TYPE A, SUBBASE GRANULAR MATERIAL, TYPE B, or SUBBASE GRANULAR MATERIAL, TYPE C.

## SECTION 312. STABILIZED SUBBASE

**312.01 Description.** This work shall consist of furnishing, placing, and compacting hot-mix asphalt (HMA), cement aggregate mixture, or pozzolanic stabilized mixture on the subgrade.

**312.02 General.** The Contractor shall have the option within the time limitations and weather condition requirements of selecting the type of stabilization, except no change in type will be permitted unless authorized by the Engineer. When time limitations or weather conditions require that construction of a particular type of stabilization be discontinued, the Contractor shall proceed without delay with the construction of an alternate type which is permissible under the requirements of this Section. The Contractor will receive no additional compensation by reason of such change.

Stabilized subbase shall not be placed on frozen or muddy subgrade.

The amount of stabilized subbase constructed will be limited to that which can be surfaced during the current construction season.

The Contractor shall have at all times one day's production of subbase prepared ahead of the paving location.

Prior to placing the stabilized mixture, the subgrade shall be prepared according to Section 301, except Articles 301.05 and 301.06 will not apply, or according to Section 302 when soil modification is used.

**HOT-MIX ASPHALT**

**312.03 Materials.** Materials shall be according to Section 1030.

**312.04 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Steel Wheel Rollers (Note 1) .....	1101.01(e)
(b) Self-Propelled Pneumatic-Tired Roller (Note 2) .....	1101.01
(c) Vibratory Roller .....	1101.01
(d) Spreading and Finishing Machine (Note 3) .....	1102.03
(e) Trench Roller (Note 4) .....	1101.01
(f) Subgrade Machine .....	1103.09

Note 1. Steel rollers shall weigh not less than 6 tons (5.5 metric tons) nor more than 12 tons (11 metric tons), and shall have a compression on the drive wheels of not less than 190 lb/in. (33 N/mm) nor more than 400 lb/in. (70 N/mm) of width of roller.

Note 2. The self-propelled pneumatic-tired roller shall develop a compression of not less than 300 lb/in. (53 N/mm) of width of tire tread in contact with the hot-mix asphalt (HMA) surface.

Note 3. Subbase in miscellaneous areas, too small to accommodate the spreading and finishing machine, may be placed with a mechanical spreader approved by the Engineer.

Note 4. Trench rollers shall be self-propelled and shall develop a compression of not less than 300 lb/in. (53 N/mm) nor more than 400 lb/in. (70 N/mm) of width on the compaction wheel.

**CONSTRUCTION REQUIREMENTS**

**312.05 Placing and Compacting.** After the subgrade has been compacted and is acceptable to the Engineer, the HMA shall be placed with a spreading and finishing machine. The maximum compacted thickness of each lift shall be 6 in. (150 mm), provided the required density is obtained. The minimum compacted thickness of each lift shall be according to the following.

Nominal Maximum Aggregate Size of Mixture	Minimum Compacted Lift Thickness
CA 12 – 1/2 in. (12.5 mm)	1 1/2 in. (38 mm)
CA 10 – 3/4 in. (19 mm)	2 1/4 in. (57 mm)
CA 6 – 1 in. (25 mm)	3 in. (75 mm)

The surface of each lift shall be clean and dry before succeeding lifts are placed.

Immediately after each lift is placed, it shall be compacted with a vibratory roller and another roller.



The density of the compacted HMA shall be according to Article 1030.05(d)(3), (d)(4), and (d)(7).

The HMA mixture shall be delivered at a temperature of 250 to 350 °F (120 to 180 °C).

Any areas of the subbase which have been damaged shall be repaired by the Contractor to the satisfaction of the Engineer.

**312.06 Finishing.** The compacted subbase shall be placed above the plan elevation and the excess trimmed or cut with the subgrade machine. The Contractor shall determine the amount of excess subbase material necessary to meet this requirement.

**CEMENT AGGREGATE MIXTURE**

**312.07 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Portland Cement (Note 1) .....	1001
(b) Water .....	1002
(c) Coarse Aggregate (Note 2) .....	1004.04
(d) Bituminous Materials (Note 3) .....	1032.07 – 1032.09

Note 1. Only Type I or Type IA portland cement shall be used. Bulk cement may be used provided the equipment for handling the cement is approved by the Engineer.

Note 2. The aggregate shall be according to the following gradation requirements as determined according to Illinois Modified AASHTO T 27/T 11.

Sieve	Percent Passing
Passing 1 in. (25.0 mm) sieve	100%
Passing 1/2 in. (12.5 mm) sieve	60 - 100%
Passing No. 4 (4.75 mm) sieve	55 - 75%
Passing No. 8 (2.36 mm) sieve	40 - 65%
Passing No. 200 (75 µm) sieve	5 - 15%

When blending is approved, fine material will be permitted in the blend, provided that the fine aggregate is Class C quality or higher and the mineral filler complies with the requirements of Article 1011.01. Blending proportions shall not be changed during the progress of the work without permission from the Engineer.

Note 3. The bituminous material used as a protective cover shall be emulsified asphalt RS-2, CRS-2, HFE 60, HFE 90, or HFE 150; rapid curing liquid asphalt RC-70; or medium curing liquid asphalt MC-70 or MC-250.

**312.08 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Steel Wheel Rollers (Note 1) .....	1101.01(e)
(b) Tamping Rollers (Note 2) .....	1101.01
(c) Pneumatic-Tired Rollers .....	1101.01
(d) Trench Roller (Note 3) .....	1101.01
(e) Vibratory Roller .....	1101.01
(f) Subgrade Planer .....	1103.08
(g) Subgrade Machine .....	1103.09
(h) Cement Aggregate Mixture Equipment .....	1104.01

Note 1. Steel wheel rollers shall weigh from 6 to 12 tons (5.5 to 11 metric tons) and shall have a compression on the drive wheels of not less than 190 lb/in. (33 N/mm) nor more than 400 lb/in. (70 N/mm) of width of roller.

Note 2. In addition to the requirements of Article 1101.01, the tampers shall be long enough to penetrate within 1 in. (25 mm) of the prepared subgrade on the initial rolling.

Note 3. Trench rollers shall be self-propelled and shall develop a compression of not less than 300 lb/in. (53 N/mm) nor more than 400 lb/in. (70 N/mm) of width on the compaction wheel.

**CONSTRUCTION REQUIREMENTS**

**312.09 General.** The cement aggregate mixture (CAM) shall be placed only when the air temperature in the shade is above 40 °F (4 °C).

**312.10 Composition.** The Contractor shall submit to the Engineer a minimum of 25 lb (11 kg) of cement and 150 lb (70 kg) of aggregate which the Contractor proposes to use in the mixture at least 60 days prior to the construction of the stabilized subbase. Samples of the materials shall be taken under the supervision of the Engineer. The quantity of portland cement to be added to the aggregate shall be not less than five nor more than eight percent of the oven dry weight (mass) of the aggregate. The actual proportions of cement, water, and aggregate material will be set by the Engineer, according to the Department's Geotechnical Manual procedure, before work begins. The proportions will be based on tests conducted on mixtures composed of the samples of the constituent materials furnished by the Contractor. The cement content will be determined in the laboratory according to AASHTO T 135 and AASHTO T 136 and shall be such that the loss in weight (mass) will not be more than ten percent after 12 cycles of wetting and drying and freezing and thawing.

**312.11 Mixing.** The constituents of the mixture shall be accurately proportioned and thoroughly mixed in a mechanical mixer. The control of the mixture shall be of such accuracy that the quantity of cement shall be within  $\pm 0.3$  percent of the amount set by the Engineer.

The measuring devices for proportioning the mixture, either by volume or by weight, shall be of such accuracy that the proportions of the mixture will be

maintained within the tolerances set forth in this Specification. The equipment used must be provided with means, meeting with approval of the Engineer, for calibration and check tests of the measuring devices.

In all plants, the water shall be proportioned by weight or volume and there shall be means by which the Engineer may readily verify the amount of water per batch or the rate of flow for continuous mixing.

The Contractor shall provide a platform scale and make arrangements for the use of a certified truck scale of sufficient capacity for calibration and periodic check tests of the feeders or measuring devices as needed during the production.

The mixer shall be capable of producing a uniform mixture. Mixing operations shall be continued until all ingredients are distributed evenly throughout the mixture and a uniform mixture, free of segregation, satisfactory to the Engineer, is obtained. The mixer shall be capable of discharging the mixture without undue segregation.

The moisture content at the time of mixing shall be such that the moisture content at the time of compaction will be within 80 to 110 percent of the optimum moisture determined.

**312.12 Placing and Compacting.** The construction requirements for subbase granular material, Type A, as stipulated in Section 311 shall apply to the construction of the CAM, except as stated. References to granular material in Section 311 shall be construed to include CAM.

The CAM shall be spread for the full width of the subbase.

Depositing and spreading operations shall be conducted so that the total time elapsing from the time water is added to the mixture until compaction is started will be less than 60 minutes. The compaction operations must be started within 30 minutes from the time the material is deposited on the subgrade.

The type, size, number of compactors, and the rate of their operations, shall be such that the section being processed will be fully compacted within two hours of the time that the water is added to the mixture.

If, for any reason, construction operations are delayed or suspended and the Engineer orders any loose or uncompacted material removed and disposed of, this work shall be performed at no additional cost to the Department.

The CAM may be constructed in one lift. If the density requirement cannot be complied with by placement in a single lift, then the mixture shall be constructed in two approximately equal lifts. The first lift shall be maintained in a moistened condition by means of a fine spray until the succeeding lift is placed. Just prior to placing the second lift, the upper 1/2 in. (13 mm) of the existing lift shall be scarified.

The dry density of the full depth of each compacted lift shall be 100 percent of the standard dry density as determined according to AASHTO T 134 (Method B) on the field mixture, unless the Contractor requests a variance of the first day's CAM placement.

The Department may consider a variance to approve the Contractor's request to establish a mix and procedures, providing that the following conditions are agreed to before starting work.

- (a) The mix shall consist of aggregate conforming to the requirement for CAM and seven percent cement.
- (b) A minimum compaction of 98 percent will be accepted, provided adjustments in mix or procedures are implemented to achieve a final compaction of 100 percent before the end of the day.
- (c) No variance will be permitted after the first day's placement and 100 percent compaction will be required for all subsequent work.
- (d) If the compaction does not comply with this requirement, the condition shall be corrected or the material replaced to conform to the specifications.

The density will be determined for compliance with these specifications by the Engineer according to AASHTO T 191, Illinois Modified AASHTO T 310 (Direct Transmission Density/Backscatter Moisture), or by other methods approved by the Engineer.

The CAM within the section being processed shall be constructed the full width and depth and the surface shall be trimmed and finished within a single working day.

No CAM may be salvaged.

**312.13 Finishing.** When initial compaction of the top lift of the CAM is nearing completion, the surface shall be shaped to the required lines, grades, and cross section according to the requirements of Article 311.06, and compaction continued until uniform and adequate compaction is attained. The moisture content of the surface material shall be maintained by means of a fine spray at or slightly above its optimum during all finishing operations and until the curing material is applied.

**312.14 Protection and Cover.** After the CAM has been finished, it shall be protected against drying for a period of seven days by applying a bituminous material. The bituminous material shall be applied as soon as possible after the completion of finishing operations, but in no event shall the finished CAM remain without cover for more than 24 hours. The equipment used for wetting the finished CAM with water or to apply a bituminous protective cover shall be of such limited weight that its use will not cause marring or rutting of the subbase.

The bituminous material shall be applied at the rate of approximately 0.20 gal/sq yd (1 L/sq m) uniformly to the surface of the subbase by a pressure distributor to give complete coverage without excessive runoff. The exact rate of application and temperature will be specified by the Engineer. At the time the bituminous material is applied, the surface shall be tightly knit, free of all loose or extraneous material, and shall contain sufficient moisture to prevent penetration of the bituminous material. If needed, water shall be applied to fill the surface voids immediately before the bituminous cover is applied. Should it be necessary for construction equipment or other traffic to use the bituminous covered CAM before the

bituminous material has hardened sufficiently to prevent pickup, sufficient sand shall be applied to prevent pickup.

Any finished or completed portion of the subbase which is traveled by construction equipment, or by other traffic, shall be protected in such a manner as to prevent the equipment or other traffic from marring or damaging the completed work.

At any time when the air temperature may be expected to reach the freezing point during the protection period, the subbase shall be protected from freezing with not less than 6 in. (150 mm) of loose, dry straw for seven days after placement or until the CAM has hardened.

After the seven day protection period, the straw shall be removed and disposed of according to Article 202.03.

**312.15 Construction Joints.** At the end of each day's construction, or when construction operations are delayed or suspended and the Engineer so orders, a straight transverse construction joint shall be formed by cutting back into the completed work to form a vertical face. Damage to completed work shall be avoided.

**POZZOLANIC STABILIZED MIXTURE**

**312.16 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Water .....	1002
(b) Coarse Aggregate (Note 1) .....	1004.04
(c) Hydrated Lime .....	1012.01
(d) Portland Cement (Note 2) .....	1001
(e) Fly Ash .....	1010
(f) Water Reducing Admixture (Note 3) .....	1021
(g) Sand Cover .....	1003.01(a), 1003.01(e)
(h) Bituminous Materials (Note 4) .....	1032.07 – 1032.09

Note 1. The gradation requirements as determined according to Illinois Modified AASHTO T 27 / T 11 shall be as follows.

Sieve	Percent Passing
Passing 1 1/2 in. (37.5 mm) sieve	100 %
Passing 1 in. (25 mm) sieve	90 – 100 %
Passing 1/2 in. (12.5 mm) sieve	60 – 100 %
Passing No. 4 (4.75 mm) sieve	40 – 70 %
Passing No. 40 (425 µm) sieve	0 – 25 %
Passing No. 200 (75 µm) sieve (gravel)	0 – 10 %
(crushed stone and slag)	0 – 15 %

Alternate gradations will be considered, provided mixture design data is furnished to the Department for analysis. Specialized durability testing may be required for unique aggregate gradations or proposed combinations of materials for which the Department does not have historical performance data. Production gradation tolerances shall be as stated in Articles 1003.01 and 1004.01. The coarse or fine aggregate gradation which most nearly resembles the proposed gradation will be utilized for production tolerances.

Boiler Slag. In addition to the aggregates permitted in Article 1004.04, boiler slag may be used. The slag shall be wet-bottom boiler slag produced as a by-product of a power plant burning pulverized bituminous coal. The slag shall be composed of hard durable particles and shall be free of excessive or harmful amounts of foreign substances. Boiler slag in an oven dry condition shall conform to the following gradation requirements.

Sieve	Percent Passing
Passing No. 4 (4.75 mm) sieve	80 – 100 %
Passing No. 10 (2.00 mm) sieve	55 – 90 %
Passing No. 40 (425 µm) sieve	0 – 25 %
Passing No. 200 (75 µm) sieve	0 – 10 %

Note 2. Only Type 1 or Type 1A shall be used.

Note 3. A water reducing admixture may be used if permitted by the Engineer. No adjustments will be made in the required lime or cement and pozzolan contents for this addition.

Note 4. The bituminous material used for curing shall be emulsified asphalt RS-2, CRS-2, HFE 90, or HFE 150; rapid curing liquid asphalt RC-70; or medium curing liquid asphalt MC-70 or MC-250.

The Contractor shall submit to the Engineer a minimum of 25 lb (11 kg) of lime or cement, 50 lb (25 kg) of fly ash, and 100 lb (50 kg) of the aggregate which the Contractor proposes to use in the mixture. The lime, when sampled, shall immediately be placed in a sealed container and shall be kept sealed. Samples shall be furnished at least 60 days prior to the construction of the subbase. The submitted samples will be tested for individual acceptance, for making design mixes, and for determining a tentative placement cut-off date.

**312.17 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Steel Wheel Rollers (Note 1) .....	1101.01(e)
(b) Tamping Rollers (Note 2) .....	1101.01
(c) Pneumatic-Tired Rollers .....	1101.01
(d) Trench Roller (Note 3) .....	1101.01
(e) Vibratory Roller .....	1101.01
(f) Pozzolanic Aggregate Mixture Equipment .....	1104.01
(g) Mechanical Spreader (Note 4)	
(h) Wheel Saw (Note 5)	
(i) Subgrade Planer.....	1103.08
(j) Subgrade Machine.....	1103.09

Note 1. Steel wheel rollers shall weigh from 6 to 12 tons (5.5 to 11 metric tons) and shall have a compression on the drive wheels of not less than 190 lb/in. (33 N/mm) nor more than 400 lb/in. (70 N/mm) of width of roller.

Note 2. In addition to the requirements of Article 1101.01, the tampers shall be long enough to penetrate within 1 in. (25 mm) of the prepared subgrade on the initial rolling.

Note 3. Trench rollers shall be self-propelled and shall develop a compression of not less than 300 lb/in. (53 N/mm) nor more than 400 lb/in. (70 N/mm) of width on the compaction wheel.

Note 4. The mechanical spreader shall be self-propelled and equipped with an automatic screed and grade sensing controls which control the longitudinal grade and transverse slope of the screed. Screed controls shall be such that compensation for differences from the established slope and grade will be completely automatic. The screed shall be adjustable to produce the required cross section.

Note 5. The saw shall be capable of cutting the required joints to the width and depth shown on the plans, perpendicular to the pavement surface, and without excessive spalling or raveling.

**CONSTRUCTION REQUIREMENTS**

**312.18 General.** The activator for pozzolanic stabilized mixtures shall either be cement or lime at the option of the Contractor and the mixture shall be constructed between April 15 and October 15, except when lime fly ash is used, the transition date indicated in Table A will apply. Mixtures shall only be constructed when the air temperature in the shade is above 40 °F (4 °C).

The Contractor shall request, in writing, specific mixture design modifications for extension of the October 15 or transition dates in Table A. Samples of ingredient materials and request for verification shall be submitted to the Engineer by September 15 for cement activator and by August 15 for lime activator. Approval will be based on consideration of the cured strength development characteristics as

determined by the Department's Geotechnical Manual procedure and the predicted curing degree days. The Department may extend the construction season beyond the transition dates indicated for lime fly ash mixture. In no case shall cement fly ash subbase be constructed after November 7 in the Northern Zone (Districts 1 - 4) and after November 15 in the Southern Zone (Districts 5 - 9).

The amount of pozzolanic stabilized mixture constructed shall be limited to that which can be surfaced during the current construction season. The Contractor shall assure the Department that sufficient quantities of inspected ingredient material are available to complete the work.

TABLE A TRANSITION DATES FOR POZZOLANIC STABILIZED MIXTURE		
Required Compressive Strength, psi (kPa) <sup>4/</sup> (14 Day Cure @ 22 °C)		
Transition Date <sup>1/</sup>	Northern Zone <sup>2/</sup>	Southern Zone <sup>3/</sup>
Sept. 15	700 (4,800)	650 (4,500)
Oct. 1	850 (5,800)	700 (4,800)
Oct. 15	950 (6,500)	850 (5,800)

1/ The transition date must be verified by samples, representing July production, submitted to the Department by August 15 for testing.

2/ Districts 1, 2, 3, 4.

3/ Districts 5, 6, 7, 8, 9.

4/ According to AASHTO T 22, with no correction for the length-to-diameter ratio.

**312.19 Composition.** The cement or lime, pozzolan, and aggregate shall be proportioned within the following approximate limits on a dry weight basis.

APPROXIMATE PERCENT BY WEIGHT OF OVEN DRY AGGREGATE		
Ingredient	Gravel, Crushed Stone, Crushed Slag, or Aggregate Blend	Boiler Slag
Cement	3 to 5	3 to 6
Lime	3.5 to 6	3.5 to 6
Pozzolan	9 to 20	18 to 40
Aggregate	74 to 88.5	54 to 79.5

The actual proportions of lime or cement, pozzolan, water, and aggregate will be set by the Engineer before work begins. The actual proportions will be based on tests conducted on sample mixtures of the constituent materials furnished by the Contractor. The Department's Geotechnical Manual procedure will be utilized. The composition of the mixture will be such that when molded into cylinders (as prescribed in the Department's Geotechnical Manual procedure) and cured at 72 °F ± 2 °F (22 °C ± 1 °C) (14 day cure), the cylinders will have a minimum average compressive strength of 600 psi (4,100 kPa) according to AASHTO T 22 with no correction for the length-to-diameter ratio; with no individual test below 500 psi



(3,400 kPa). The right is reserved by the Engineer to make changes in proportions during the progress of the work as the Engineer may consider necessary.

**312.20 Mixing.** Mixing shall be accomplished according to Article 312.11, except the control of the mixture shall be of such accuracy that the proportions of the mixture based on total dry weight will be maintained within the following tolerances.

Cement/Lime .....	± 0.5 percent by weight
Pozzolan .....	± 1.5 percent by weight
Aggregate .....	± 2.0 percent by weight

If a water reducing admixture is used, the automatic dispensing system shall be capable of continuously introducing the desired quantity of admixture within the range of ± 0.03 gal/min (± 0.11 L/min).

When constructing a cement/lime or pozzolan stabilized subbase, mixing and spreading operations shall be coordinated such that not more than 90 minutes shall elapse from the time water is added to the mixture and compaction operations begin.

**312.21 Placing, Compacting, and Finishing.** The mixture shall be placed on subgrade conforming to the requirements of Section 301. The Contractor shall have, at all times, at least 800 ft (240 m) of subgrade prepared in advance of the subbase placement. The pozzolanic stabilized mixture shall be constructed in lifts not more than 4 in. (100 mm) thick when compacted. If tests indicate that the desired results are being obtained, the compacted thickness of any lift may be increased to a maximum of 8 in. (200 mm) for lime fly ash and 12 in. (300 mm) for cement fly ash. When the thickness specified is more than maximum thickness, the mixture shall be placed in two or more approximately equal lifts. Each lift shall be deposited full width directly on the prepared subgrade or on the preceding lift of compacted mixture with a mechanical spreader or spreader box of a type approved by the Engineer. Where the mixture must be placed in more than one lift, the previous lift shall be maintained in a moistened condition until the succeeding lift is placed. After having been tested for density and approved by the Engineer, the previous lift shall be dampened with water, if required by the Engineer. The second lift shall be placed the same day as the first lift. When placed, the pozzolanic stabilized mixture shall be free from segregation and shall require minimum blading and manipulation.

Particular care shall be exercised to ensure satisfactory density along the edges of the section and adjacent to construction joints. The type, size, number of compactors, and the rate of their operation shall be such that the section being processed will be fully compacted within three hours of the time water is added to the mixture. The first lift of the subbase shall be compacted to at least 97 percent of maximum density. The succeeding lifts of subbase shall be compacted to 100 percent of maximum density. The maximum density will be determined according to AASHTO T 180, Method C, except that the five lift requirement is replaced with three lifts.

The density of each lift of the compacted subbase will be determined by the Engineer for compliance with these Specifications according to AASHTO T 191, Illinois Modified AASHTO T 310 (Direct Transmission Density/Backscatter Moisture), or by other methods approved by the Engineer. If these tests indicate that the lift

does not comply with the density requirements, the condition shall be corrected or the material replaced to conform to these Specifications.

In constructing the top lift, the grade shall be kept at sufficient height so that the top surface, when compacted, will be at or slightly above grade, rather than below grade. Finish grading shall be accomplished by removing excess material followed by recompaction by rolling. In the event that low areas occur, they shall be reconstructed to the satisfaction of the Engineer.

If any subgrade material is worked into the pozzolanic stabilized mixture during the compacting or finishing operations, all pozzolanic mixture within the affected area shall be removed and replaced with new material. Any finished or completed portion of the subbase which is traveled by construction equipment, or by other traffic, shall be protected in such a manner as to prevent the equipment or other traffic from marring or damaging the completed work. The Engineer may restrict hauling over partially completed work or uncured subbase after inclement weather or at any time when the subgrade is soft and there is a tendency for the subgrade material to work into the pozzolanic stabilized mixture.

When initial compaction of the mixture is nearing completion, the surface of the subbase shall be shaped to the required lines, grades, and cross section. The moisture content of the surface of the subbase mixture shall be maintained at or slightly above its specified optimum during all finishing operations and until the curing material is applied.

Surface compaction and finishing shall be done in such a manner as to produce a smooth, closely knit surface, relatively free from cracks, ridges, low spots, or loose material. The finished surface shall be tested for crown and elevation by means of a template and shall meet the tolerance in thickness requirement as stated herein.

If for any reason construction operations are delayed or suspended and the Engineer orders any loose or uncompacted material removed and disposed of, this work shall be performed at no additional cost to the Department. No pozzolanic stabilized mixture may be salvaged.

**312.22 Curing.** After the pozzolanic stabilized mixture has been constructed, the surface shall be kept continuously moist until the bituminous curing cover is applied. The bituminous curing cover shall be applied no later than 24 hours following final compaction, unless in the judgment of the Engineer it should be delayed. The application of the curing cover shall be according to Article 312.14.

Paving may proceed after the curing cover has been applied and cured to the satisfaction of the Engineer. At least 14 hours for lime fly ash and 12 hours for cement fly ash shall elapse between the time the curing cover material is applied and paving begins.

**312.23 Construction Joints and Maintenance.** At the end of each day's construction, a straight transverse construction joint shall be formed by cutting back into the completed work to form a vertical face. If the cement fly ash subbase paving operations are discontinued for more than 24 hours or when the mixture has taken a set prior to the achievement of acceptable compaction, a longitudinal and/or transverse saw joint shall be cut and the material in the affected area shall be

removed and disposed of according to Article 202.03. Damage to completed work shall be avoided.

In areas where irregular width, inaccessibility, or unavoidable obstacles make the use of mechanical spreading equipment impractical, such equipment will not be required, and the Contractor may use other methods approved by the Engineer. If full-width placement is impractical, placing the adjacent pass(es) with the specified mechanical spreader to achieve the desired pavement width must be completed the same day as placement of the first pass.

The Contractor shall maintain the entire subbase in a manner satisfactory to the Engineer until the pavement has been completed. Maintenance shall include immediate repairs of any defective or damaged portions of the subbase. Repairs or replacements shall be made in such a manner as to ensure restoration of a uniform surface and durability of the portion repaired or replaced. The Contractor shall also remove and replace full-depth any pozzolanic aggregate mixture which is unsatisfactory due to its being placed over excessively wet or otherwise unstable subgrade; damaged by rain, freezing or other climatic conditions; damaged by traffic; or which is unsatisfactory due to failure to comply with any of the requirements specified.

**CEMENT AGGREGATE MIXTURE II**

**312.24 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate (Note 1) .....	1004.01-1004.02
(b) Fine Aggregate (Note 2) .....	1003.01-1003.02
(c) Portland Cement .....	1001
(d) Water .....	1002
(e) Concrete Curing Materials (Note 3) .....	1022
(f) Emulsified Asphalts (Note 4) .....	1032.06
(g) Concrete Admixtures .....	1021
(h) Fly Ash .....	1010

Note 1. Coarse aggregate shall be gradation CA 6, CA 7, CA 9, CA 10, or CA 11, Class D quality or better.

Note 2. Fine aggregate shall be FA 1 or FA 2.

Note 3. Membrane Curing Compound shall be Type III.

Note 4. RS-2 or CRS-2 shall be used.

**312.25 Equipment.** Equipment shall be according to Article 420.03.

**CONSTRUCTION REQUIREMENTS**

**312.26 Proportioning.** At least 60 days prior to start of placing CAM II, the Contractor shall submit samples of materials for proportioning and testing. The mixture shall contain a minimum of 200 lb (90 kg) of cement per cubic yard (cubic meter). For Type I cement, a maximum of 15 percent of cement may be replaced by fly ash at a 1:1.5 cement-to-fly ash ratio (weight basis). Blends of coarse and fine aggregates will be permitted, provided the volume of fine aggregate does not exceed the volume of coarse aggregate. The Engineer will determine the proportions of materials for the mixture.

Air-entraining admixture and water-reducing admixture shall be added. Water-reducing admixtures shall be added to the mixer separately from air-entraining admixtures according to the manufacturer's printed instructions. The air-entrainment agent and the other admixture(s) shall be compatible. The water and air content of freshly mixed air-entrained CAM II shall be based upon trial mixes with the materials to be used in the work adjusted to produce a mixture of the required plasticity, workability, and durability. The mixture shall have a relative durability of 80 percent at 100 cycles when tested according to AASHTO T 161 Procedure B. The percentage of air-entrainment shall not be less than seven percent nor more than ten percent. Air content shall be determined according to Article 1020.08. The mix shall have a slump of 1 to 3 in. (25 to 75 mm). Slump shall be determined according to Article 1020.07.

**312.27 Mixing and Placing.** CAM II shall be mixed according to Article 1020.11(c). CAM II shall be placed when the air temperature in the shade is a minimum of 40 °F (4 °C). Forms and form setting shall be according to Article 420.06 or as approved by the Engineer. The use of a mechanical form tamper will not be required. When a slipform paver will be used for placing the portland cement concrete or continuously reinforced portland cement concrete pavement, the CAM II subbase shall be constructed to a width 6 in. (150 mm) wider than the width outside-to-outside of the slipform paver's tracks. When this results in a width greater than shown on the plans or typical section, such extended width will not be measured for payment but shall be included in the unit price bid for the CAM II subbase. Placing CAM II shall be according to the requirements of Article 420.07, except that a mechanical concrete spreader will not be required. Vibratory screeds will be permitted. Slipform paving methods may be used, provided the requirements of Article 420.14(c) are met.

**312.28 Finishing and Testing.** After the CAM II subbase has been struck off and consolidated, and while it is still plastic, the surface including the paver trackline shall not have variations of more than 3/16 in. (5 mm) in 10 ft (3 m) measured parallel with the centerline of pavement. Any depressions shall immediately be filled with fresh CAM II mix, struck off, consolidated and refinished. Bumps shall be cut off and the area refinished. The finished surface shall not be textured, but shall be closed.

CAM II samples shall be furnished by the Contractor and shall be taken from unconsolidated material on grade to determine the slump and air content. Testing shall be according to Article 1020.07 and 1020.08.

**312.29 Curing.** Immediately after the finishing operations have been completed, the surface shall be cured and protected according to Articles 1020.13(a)(4), 1020.13(c) and 1101.09. All areas of membrane curing

compound damaged by rain or other cause within the required three day curing period shall be repaired by applying another coat. Membrane curing compound damaged after the three-day curing period shall be repaired by reapplying membrane curing compound or by applying emulsified asphalt applied at the approximate rate of 0.20 gal/sq yd (1 L/sq m) to the surface with a pressure distributor according to the requirements of Article 1102.05.

**312.30 Protection.** Minor construction traffic will not be permitted on the completed subbase for at least three days, and no batch or haul trucks will be permitted on the completed subbase unless approved by the Engineer. Any CAM II mixture which is unsatisfactory due to rain, freezing, or other climatic conditions; damaged by traffic; or which is unsatisfactory due to failure to comply with any of the requirements specified shall be removed and replaced.

### STABILIZED SUBBASE – ALL TYPES

**312.31 Tolerance in Thickness.** The stabilized subbase shall be constructed to the thickness shown on the plans. Determination of thickness will be based on measurements taken at cored holes or at the edge of the subbase.

When the constructed thickness is less than 90 percent of the specified thickness, the stabilized subbase shall be corrected. The method of correction shall be removal and replacement, except as follows.

- (a) HMA Stabilized Subbase. When HMA stabilized subbase is used, the deficient thickness may be corrected by placing additional HMA, provided the lift thickness requirements of Article 312.05 are met.
- (b) Portland Cement Concrete Pavement. When portland cement concrete pavement is to be constructed, the deficient thickness may be corrected by increasing the thickness of the pavement. This method of correction will not be allowed for continuously reinforced concrete pavement.

The surface elevation of the completed stabilized subbase, shall not exceed by more than 3/16 in. (5 mm) the surface elevation shown on the plans or authorized by the Engineer.

**312.32 Method of Measurement.** This work will be measured for payment as follows.

- (a) Contract Quantities. The requirements for the use of Contract Quantities shall conform to Article 202.07(a).
- (b) Measured Quantities. This work will be measured for payment in place and the area computed in square yards (square meters). The width measured will be at the top of the final lift of the completed work as shown on the plans or as directed by the Engineer.

**312.33 Basis of Payment.** When the Contractor has the option of which material type to use, this work will be paid for at the contract unit price per square yard (square meter) for STABILIZED SUBBASE of the thickness specified.

When the Department requires a specific material type be used, this work will be paid for at the contract unit price per square yard (square meter) for STABILIZED SUBBASE – HMA, STABILIZED SUBBASE – CAM, STABILIZED SUBBASE – POZZOLANIC, or STABILIZED SUBBASE – CAM II of the thickness specified.

## BASE COURSE

### SECTION 350. LIME STABILIZED SOIL MIXTURE

**350.01 Description.** This work shall consist of the construction of a lime stabilized soil mixture composed of soil, lime, and water which shall be considered as base course.

This work shall be according to Section 310, except the lime stabilized soil mixture shall provide a minimum laboratory average compressive strength of 150 psi (1030 kPa), according to AASHTO T 208.

**350.02 Method of Measurement.** This work will be measured for payment according to Article 310.14.

**350.03 Basis of Payment.** This work will be paid for according to Article 310.15.

### SECTION 351. AGGREGATE BASE COURSE

**351.01 Description.** The base course shall consist of furnishing one or more courses of aggregate on a prepared subgrade or subbase.

**351.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate .....	1004.04

**351.03 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Tamping Rollers .....	1101.01
(b) Pneumatic-Tired Rollers .....	1101.01
(c) Steel Wheel Rollers (Note 1) .....	1101.01(e)
(d) Aggregate Spreaders .....	1102.04
(e) Vibratory Machine (Note 2)	

Note 1. Three-wheel or tandem rollers shall weigh from 6 to 10 tons (5.5 to 9 metric tons) and shall weigh not less than 200 lb/in. (35 N/mm) nor more than 325 lb/in. (57 N/mm) of width of the roller.

Note 2. The vibratory machine shall meet the approval of the Engineer.

**CONSTRUCTION REQUIREMENTS**

**351.04 Subgrade.** The subgrade shall be prepared according to Section 301, except Articles 301.06 and 301.07 will not apply.

**351.05 Base Course.** The aggregate shall be uniform in gradation. Wetting the aggregate in cars, bins, stockpiles, or trucks will not be permitted.

The base course shall be constructed in lifts not more than 4 in. (100 mm) thick when compacted, except that if tests indicate that the desired results are being obtained, the compacted thickness of any lift may be increased to a maximum of 8 in. (200 mm). The aggregate shall be deposited full-lane width, directly on the prepared subgrade or on the preceding lift of compacted aggregate with a spreader. When placed, it shall be free from segregation and shall require minimum blading or manipulation. Immediately after the material has been placed, it shall be compacted with a tamping roller, or with a pneumatic-tired roller, or with a vibratory machine, or with a combination of any of the three. The top lift shall be given a final rolling with a steel wheel roller. The manner of compaction shall be approved by the Engineer.

If any subgrade material is worked into the base material during the compacting or finishing operations, all granular material within the affected area shall be removed and replaced with new aggregate. The Engineer may restrict hauling over the completed or partially completed work after inclement weather or at any time when the subgrade is soft and there is a tendency for the subgrade material to work into the base material.

Specific requirements for Type A and Type B aggregate base course shall be as follows.

- (a) Type A. The aggregate shall have a bearing ratio of not less than 80, except that if the aggregate used is crushed gravel, crushed stone, or crushed slag, the bearing ratio will not be required.

The bearing ratio will be determined according to the Standard methods adopted by the Department.

A sample of the aggregate to be used shall be submitted to the Engineer at least 15 days prior to starting construction. The sample so submitted will be tested by the Department for acceptance.

Before the aggregate is deposited on the subgrade, it shall contain the amount of moisture required for compaction. The amount of moisture required shall be that determined by the Engineer for the material and compaction methods being used. The water and aggregate shall be mixed through a controlled aggregate mixing system. The system shall consist of a mechanical mixing device, and aggregate and water measuring devices, meeting the approval of the Engineer.

The granular material shall be compacted to not less than 100 percent of the standard laboratory density. The standard laboratory density shall be the

maximum dry density determined according to AASHTO T 99 (Method C). A coarse particle correction according to AASHTO T 224 shall be used.

The dry density of the compacted base course, will be determined by the Engineer at regular intervals according to AASHTO T 191, Illinois Modified AASHTO T 310 (Direct Transmission Density/Backscatter Moisture), or by other methods approved by the Engineer.

If these tests indicate that the base course does not comply with the density requirements, additional wetting, if necessary, and rolling will be required until the density is obtained. Moisture shall be added to the material during compaction only when it is necessary to increase the percentage of moisture to obtain the required density.

- (b) Type B. The moisture content shall be sufficient to prevent segregation of the aggregate. Water shall be added as required by the Engineer to obtain compaction satisfactory to the Engineer.

**351.06 Tolerance in Thickness.** The base course shall be constructed to the thickness shown on the plans. Thickness determinations will be made at such points as the Engineer may select. When the constructed thickness is less than 90 percent of the specified thickness shown on the plans, aggregate shall be added to obtain the required specified thickness.

**351.07 At Bridges, Railroad Grade Crossings, and Existing Pavement.** The base course adjacent to bridges, railroad grade crossings, and existing pavement shall be 3 in. (75 mm) (compacted) greater in depth than the typical section, with the surface at the established grade. The width at bridges and railroad grade crossings shall be the same as the typical section. At existing pavement, the width shall be as shown on the plans or as directed by the Engineer. This 3 in. (75 mm) increase in depth shall be made at a uniform rate in a distance of 50 ft (15 m). The cost of excavation in this transition shall be considered as included in the cost of the base course.

**351.08 At Side Roads, Entrances, and Mailboxes.** The material used at side roads, entrances, and mailbox turnouts shall be the same as that used to construct the base course.

After the shoulders have been completed, the subgrade shall be excavated and the bottom of the excavation shall be compacted in a manner approved by the Engineer. The earth excavated in preparing the subgrade shall be disposed of within the right-of-way, as directed by the Engineer, within a distance of 1000 ft (300 m) from the place of excavation.

The excavation, preparation of subgrade and disposal of surplus excavation shall be considered as included in the cost of the base course.

**351.09 Shaping, Trimming, Finishing, and Opening to Traffic.** All shaping, trimming, and finishing shall be according to Section 212. The road shall be opened to traffic according to Article 701.17(b)(1).



**351.10 Maintaining.** The Contractor shall maintain the base course until the entire section is accepted. In no case shall the maintenance period be less than ten days for any portion of the road.

In lieu of the above specified minimum ten day maintenance period, the Contractor, at his/her option, may elect to proof roll the completed aggregate base course. The test vehicle for proof rolling shall consist of a tandem axle truck loaded to a minimum gross weight of 40,000 lb (18,100 kg). Proof rolling shall consist of 40 passes in each lane of the completed aggregate base course. Any failures in the base that occur during the proof rolling shall be immediately repaired and shall be subjected to an additional five passes of the test vehicle after the initial 40 passes are completed. This process shall be repeated, if necessary, until all failed areas pass the proof rolling.

**351.11 Method of Measurement.** Aggregate used for base course will be measured for payment in tons (metric tons), cubic yards (cubic meters), or square yards (square meters) of the thickness specified. Aggregate used for maintenance will be measured for payment in tons (metric tons). The unit of measurement will be shown on the plans.

Water required to be added for compaction on the grade will not be measured for payment, but shall be considered as included in the cost of the item of work being constructed.

The requirements for the use of contract quantities and measured quantities shall be according to Articles 311.08(a) and 311.08(b), respectively.

**351.12 Basis of Payment.** This work will be paid for at the contract unit price per ton (metric ton), or cubic yard (cubic meter), for AGGREGATE BASE COURSE, TYPE A, or AGGREGATE BASE COURSE, TYPE B, or at the contract unit price per square yard (square meter) for AGGREGATE BASE COURSE, TYPE A or AGGREGATE BASE COURSE, TYPE B, of the thickness specified.

Additional aggregate required for maintenance will be paid for at the contract unit price per ton (metric ton) for AGGREGATE BASE COURSE, TYPE A or AGGREGATE BASE COURSE, TYPE B.

Except as specified above for the additional aggregate required for maintenance, the work of maintaining or proof rolling the completed aggregate base will not be paid for separately, but shall be considered as included in the unit prices bid for the construction items involved, and no additional compensation will be allowed.

**SECTION 352. SOIL-CEMENT BASE COURSE**

**352.01 Description.** This work shall consist of constructing a soil-cement base course composed of soil, portland cement, and water.

**352.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Portland Cement (Notes 1 & 2) .....	1001
(b) Soil for Soil-Cement Base Course .....	1009.03
(c) Water .....	1002
(d) Bituminous Materials (Note 3) .....	1032

Note 1. Bulk cement may be used for the traveling mixing plant method if the equipment for handling, weighing, and spreading the cement is approved by the Engineer.

Note 2. Either Type I or Type IA portland cement shall be used.

Note 3. The bituminous materials used for curing shall be emulsified asphalt RS-2, CRS-2, HFE 90, or HFE 150; rapid curing liquid asphalt RC-70; or medium curing liquid asphalt MC-70 or MC-250.

**352.03 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Pneumatic-Tired Rollers .....	1101.01
(b) Tamping Rollers (Note 1) .....	1101.01
(c) Steel Wheel Rollers (Note 2) .....	1101.01
(d) Traveling Mixing Plant (Note 3) .....	1101.07

Note 1. The tampers shall be long enough to penetrate within 1 in. (25 mm) of the subgrade on the initial rolling.

Note 2. Steel wheel rollers shall weigh from 6 to 10 tons (5.5 to 9 metric tons) and shall weigh not less than 200 lb/in. (35 N/mm) nor more than 325 lb/in. (57 N/mm) width of roller.

Note 3. When more than 12,000 sq yd (10,000 sq m) of soil-cement base course are to be processed, a traveling mixing plant will be required together with any machine, or combination of machines, or equipment which will produce in one pass completed soil-cement base course meeting the requirements of these Specifications. Mixing devices approved by the Engineer may be used when less than 12,000 sq yd (10,000 sq m) of soil-cement base course are to be processed.

**CONSTRUCTION REQUIREMENTS**

**352.04 General.** The soil-cement base course shall be constructed only when the temperature of the subgrade, measured 6 in. (150 mm) below the surface, is

above 50 °F (10 °C) and the ambient air temperature in the shade is above 45 °F (7 °C).

**352.05 Proportioning.** Proportioning shall be as follows.

- (a) **Samples.** Samples of the cement and the project soil(s) shall be obtained and submitted to the Engineer at least 90 days prior to the construction of the soil-cement base course. Sample sizes shall be a minimum of 25 lb (11 kg) for the cement and 200 lb (91 kg) for the project soil(s).
- (b) **Mix Design.** The actual proportions of cement, water, and soil will be determined by the Engineer prior to construction using the submitted samples. The Engineer reserves the right to make such adjustments in proportions as are considered necessary during the progress of the work.

In no case shall proportions or type of cement be changed during the progress of the work without permission from the Engineer.

**352.06 Preparation of Subgrade.** The area to be processed shall be shaped to the proper grade and cross section and shall be void of all vegetation and other objectionable material. In cut or at grade sections, the subgrade shall be prepared according to Articles 301.03 and 301.04; except the minimum immediate bearing value (IBV) of the soil, below the soil to be processed, shall be 3.0.

**352.07 Pulverizing.** The soil to be processed shall be scarified and pulverized prior to the application of the cement. Pulverizing shall be continued until the soil meets the gradation requirement specified in Article 352.10 and the moisture content of the soil does not exceed that which will permit a uniform mixture of soil and cement.

**352.08 Application of Cement.** The cement shall be applied uniformly on the soil. The application of cement shall be limited to such an area that all the operations specified in Articles 352.08 to 352.11, inclusive, will be continuous and completed during daylight hours; and the operations specified in Articles 352.09 to 352.11 inclusive, completed in six hours.

No equipment, except that used in spreading and mixing, will be allowed to pass over the spread cement, and this equipment shall be operated in such a manner as to avoid displacement of cement.

Cement which has been damaged by hydration due to rain prior to or during the mixing operations, has been damaged while spread contrary to the above mentioned requirements, or has been displaced by the Contractor's equipment or other traffic, shall be replaced.

**352.09 Dry Mixing.** Dry mixing of soil and cement will be required when mixing equipment other than a traveling mixing plant is used. Mixing shall be confined to the area and depth shown on the plans and shall be continued until the resulting mixture is homogeneous and uniform in appearance.

When any of the operations from the start of soil and cement mixing through final compaction are interrupted for more than 30 minutes for any reason, the entire

thickness of the base course shall be thoroughly loosened, reprocessed, and shall be completed within the specified time limits for these operations. When the uncompacted soil-cement mixture is wet by rain so that the average moisture content exceeds the tolerance given in Article 352.10 at the time of final compaction, the portion being processed shall be reconstructed according to this Specification.

**352.10 Moist Mixing.** Moist mixing shall be as follows.

- (a) **With Equipment Other Than a Traveling Mixing Plant.** If a traveling mixing plant is not used, water shall be immediately applied uniformly and incorporated into the dry-mixed soil and cement in quantities which will produce the required moisture content for the soil-cement mixture.

Water supply and pressure distributing equipment shall be provided which will ensure the application of all water required on the section being processed within three hours. Each application or increment of water shall be at least partially incorporated into the mixture, if necessary, to avoid excessive concentration of water on and near the surface.

After the last increment of water has been added, mixing shall be continued until a uniform mixture of soil, cement, and water is obtained. Particular care shall be exercised to ensure satisfactory moisture distribution along the edges of the section and for the full depth of treatment.

When water application and moist mixing is completed, the percentage of moisture in the fraction of the mixture passing a 1 in. (25 mm) sieve, on a basis of dry weight (mass), shall be between 80 and 100 percent of the optimum moisture content for sandy soils, and between 100 and 120 percent of the optimum moisture content for silty and clayey soils. At completion of moist mixing, 100 percent of the soil shall pass a 1 in. (25 mm) sieve and at least 80 percent shall pass a No. 4 (4.75 mm) sieve, exclusive of gravel or stone retained on these sieves.

- (b) **With a Traveling Mixing Plant.** After the cement is applied, it shall be mixed with soil and water with the traveling mixing plant. No mixing shall be done below the desired depth. Mixing shall be at such rate that, or shall be repeated until, a uniform mixture of soil, cement, and water is obtained. Particular care shall be exercised to ensure a satisfactory mixture along the edges of the section and for the full depth of treatment. At the completion of the mixing operation, the moisture content and gradation of the mixture shall be as specified in Article 352.10(a).

**352.11 Compaction and Finishing.** Compaction of the soil-cement mixture shall be a continuation of the moist mixing operation such that the soil-cement mixture does not remain undisturbed after mixing and before compacting for more than 30 minutes. Prior to the beginning of compaction, the mixture shall be in a loose condition for its full depth and width. The mixture shall then be uniformly compacted with tamping rollers in conjunction with other compaction equipment until the specified density has been obtained. Particular care shall be exercised to ensure satisfactory density along the edges of the section and adjacent to construction joints. The type, size, number of compactors, and the rate of their operation shall be such that the section being processed can be compacted within two hours.

When initial compaction of the soil-cement mixture is nearing completion, the surface of the base course shall be shaped to the required lines, grades, and cross section, and compaction continued until the required density is obtained. If necessary to attain satisfactory surface grade, the surface shall be lightly scarified with a nail drag, spike-tooth harrow, or weeder, and reshaped. The resulting surface then shall be thoroughly rolled with a steel wheel roller, a pneumatic-tired roller, or both. The moisture content of the surface material shall be maintained at or slightly above its specified optimum during all finishing operations and until the curing material is applied.

Surface compaction and finishing shall be done in such a manner as to produce a smooth, closely knit surface, relatively free from cracks, ridges, low spots, or loose material, conforming to the crown, grades, and lines shown on the plans. When directed by the Engineer, surface finishing methods may be varied, provided a smooth, dense, uniform surface, free of surface compaction planes is produced.

The compacted soil-cement base course shall have a minimum dry density of 95 percent of the laboratory standard dry density. The in-place dry density will be determined according to AASHTO T 191, or Illinois Modified AASHTO T 310 (Direct Transmission Density/Backscatter Moisture). The laboratory standard dry density will be determined according to AASHTO T 134 (Method B).

Any portion of the base course that has a density less than 95 percent of the standard laboratory density shall be corrected or removed and replaced.

**352.12 Compressive Strength.** Prior to compaction, the Engineer will obtain random samples from the field design mixture, to be tested for the compressive strength according to AASHTO T 22. The samples will be compacted according to AASHTO T 134 (Method B), moist cured for seven days, and will be capped and soaked four hours immediately prior to compression testing. The compacted, cured specimens shall have a minimum seven day compressive strength of 500 psi (3500 kPa) or a specified design strength, whichever is greater. Any portion of the base course that has less than the required compressive strength shall be corrected or removed and replaced.

**352.13 Protection and Cover.** After the soil-cement base course has been finished, it shall be protected against drying for a period of seven days by applying a bituminous material according to Article 312.14; except, in no event shall the finished soil-cement base course remain without cover for more than 14 hours unless prolonged rain intervenes.

**352.14 Construction Joints.** At the end of each day's construction, a straight transverse construction joint shall be formed by cutting back into the completed work to form a vertical face. Damage to completed work shall be avoided. The base course shall be constructed and finished full width each day without longitudinal joints.

**352.15 Opening to Traffic.** The base course shall be opened to traffic according to Article 701.17(b)(2).

**352.16 Maintenance.** The Contractor shall maintain the entire base course in a manner satisfactory to the Engineer until the surface course has been constructed. Maintenance shall include immediate repairs of any defective or damaged portions of the base course. Repairs or replacements shall be made in such a manner as to ensure restoration of a uniform surface and durability of the portion repaired or replaced.

**352.17 Tolerance in Thickness.** Soil-cement base course shall be constructed to the thickness shown on the plans. Determination of base thickness will be based on thickness measurements at cored points taken at locations selected by the Engineer. Any portion of the soil-cement base course that is less than 90 percent of the specified thickness shall be removed and replaced with new material to the correct thickness.

**352.18 Method of Measurement.** This work will be measured for payment as follows.

- (a) Contract Quantities. The requirements for the use of Contract Quantities shall conform to Article 202.07(a).
- (b) Measured Quantities. The work will be measured for payment as follows.
  - (1) Processing of soil-cement base course will be measured for payment in place and the area computed in square yards (square meters).
  - (2) Cement incorporated in the soil-cement mixture will be measured for payment in hundredweights (kilograms), but payment will not be made for cement in excess of 105 percent of the amount specified by the Engineer.
  - (3) Removal and disposal of unstable and/or unsuitable material will be measured for payment according to Article 202.07(b).
  - (4) Replacement of unstable and/or unsuitable material will be measured for payment according to Article 204.07(b).
  - (5) Cement treatment of unstable subgrade soil, when specified by the Engineer, will be measured for payment according to (1) and (2) above.

**352.19 Basis of Payment.** This work will be paid for at the contract unit prices as follows.

- (a) Per square yard (square meter) for PROCESSING SOIL-CEMENT BASE COURSE, of the thickness specified.
- (b) Per hundredweight (kilogram) for CEMENT.
- (c) Removal and disposal of unstable and/or unsuitable material will be paid for according to Article 202.08.
- (d) Replacement of unstable or unsuitable material will be paid for according to Article 204.08.

- (e) Cement treatment of unstable subgrade soil, when specified by the Engineer, will be paid for at the contract unit prices for (a) and (b) above.

**SECTION 353. PORTLAND CEMENT CONCRETE BASE COURSE**

**353.01 Description.** This work shall consist of constructing a portland cement concrete base with or without reinforcement as specified.

**353.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Portland Cement Concrete .....	1020
(b) Reinforcement Bars .....	1006.10
(c) Longitudinal Metal Joints, Pins, and Bar Supports .....	1006.11(a)

**353.03 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Forms .....	1103.05
(b) Formless Paver .....	1103.16
(c) Subgrade Planer .....	1103.08
(d) Subgrade Machine .....	1103.09
(e) Finishing Machine .....	1103.13
(f) Concrete Finisher Float or Mechanical Longitudinal Float ...	1103.14-1103.15
(g) Vibrator .....	1103.12, 1103.17
(h) Miscellaneous Equipment .....	1103.17
(i) Membrane Curing Equipment .....	1101.09

**CONSTRUCTION REQUIREMENTS**

**353.04 General.** The use of slip form paving will be permitted at the option of the Contractor. If the Contractor cannot obtain satisfactory results without the use of forms, the Department reserves the right to require the use of forms at no additional cost to the Department.

These items of work shall be according to the following requirements.

Item	Article/Section
(a) Preparation of Subgrade or Subbase .....	420.04
(b) Joints .....	420.05
(c) Removing Forms .....	420.11
(d) Slip Form Method .....	420.14
(e) Temperature Control for Placement .....	1020.14
(f) Tolerance in Thickness .....	420.15
(g) Bridge Approach Pavement .....	420.16
(h) Opening to Traffic .....	701.17(c)(5)

**353.05 Forms and Form Setting.** Forms and form setting shall be according to Article 420.06, except that the use of a mechanical form tamper will not be required.

**353.06 Placing Concrete.** Placing concrete shall be according to Article 420.07, except that a mechanical concrete spreader will not be required. When the base course is to be struck off and consolidated by either the vibrating screed method or the hand method, the concrete adjacent to both side forms shall be compacted with a vibrator inserted into the concrete and worked along the entire length of the forms before the finishing operations are started.

Trucks or equipment will be permitted on the finished subgrade or subbase, when permitted by the Engineer. Approval will be withdrawn if rutting develops in the subgrade or subbase which would reduce the plan thickness of the base course.

**353.07 Transverse Construction Joints.** Transverse construction joints shall be constructed according to Article 420.05(e), except that No. 6 (No. 20) tie bars 36 in. (900 mm) long shall be centered across the joint on 15 in. (375 mm) spacings.

**353.08 Adjacent to Railroad Grade Crossing.** Portland cement concrete base course adjacent to railroad grade crossing shall be constructed according to Article 420.17, except when the mainline portland cement concrete base course thickness is greater than 9 in. (225 mm), the thickness of the portland cement concrete base course adjacent to the railroad grade crossing shall be constructed to the same thickness as the mainline.

The HMA plug adjacent to railroad grade crossings shall be constructed of HMA binder course mixture according to the applicable requirements of Section 406. At the Contractor's option, HMA surface course mixture may be used in lieu of the binder course mixture.

**353.09 Adjacent to Bridge Approach Pavement or Existing Pavement.** The HMA plug adjacent to bridge approach pavement or existing pavement shall be constructed of HMA binder course mixture according to the applicable requirements of Section 406. At the Contractor's option, HMA surface course mixture may be used in lieu of the binder course mixture.

**353.10 Final Strike Off, Consolidation, and Finishing.** The concrete shall be struck off, consolidated, and finished according to Article 420.09, except the straightedging specified under Article 420.09(c) shall be performed until the entire surface does not vary more than 3/16 in. (5 mm) from the straightedge and the final finish shall be according to Article 420.09(e)(2).

**353.11 Surface Test.** The finished surface of the base course shall be within the tolerance of the following surface trueness test.

The base course will be tested for trueness in each wheel lane at the expiration of the required curing or protection period. The surface will be tested by means of a 16 ft (5 m) straightedge placed parallel to the centerline of the base course, parallel to the grade line and touching the surface. Surface variations which exceeds 3/8 in. (10 mm) will be marked and shall be removed by an approved grinding device consisting of multiple saws. The use of a bushhammer or other impact devices will



Art. 354.01          Portland Cement Concrete Base Course Widening

not be permitted. Determination of base course thickness will be made after the removal of high spots.

**353.12 Method of Measurement.** This work will be measured for payment as follows.

- (a) Contract Quantities. The requirements for the use of contract quantities shall conform to Article 202.07(a).
- (b) Measured Quantities. Portland cement concrete base course will be measured in place and the area computed in square yards (square meters). The width shall be as shown on the plans or as directed by the Engineer.

Reinforcement bars will be measured in pounds (kilograms) according to Article 508.07. Tie bars will be measured according to Article 508.07.

HMA plugs at railroad grade crossings, bridge approach pavement, or existing pavement will be measured for payment in tons (metric tons) according to Article 406.13.

**353.13 Basis of Payment.** This work will be paid for at the contract unit prices per square yard (square meter) for PORTLAND CEMENT CONCRETE BASE COURSE and HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE BASE COURSE, of the thickness specified.

Reinforcement bars in special concrete slabs will be paid for according to Article 508.08.

The unit prices bid for the various items of portland cement concrete base course shall include any added thickness of base course adjacent to railroad grade crossings.

HMA plugs at railroad grade crossings, bridge approach pavement, or existing pavement will be paid for at the contract unit price per ton (metric ton) according to Article 406.14 for HOT-MIX ASPHALT BINDER COURSE, of the mixture composition and Ndesign specified.

**SECTION 354. PORTLAND CEMENT CONCRETE BASE COURSE WIDENING**

**354.01 Description.** This work shall consist of widening existing pavement with a portland cement concrete base course widening not exceeding 6 ft (1.8 m) in width.

**354.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Portland Cement Concrete .....	1020

**354.03 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Forms .....	1103.05
(b) Finishing Machine .....	1103.13
(c) Vibrator .....	1103.12, 1103.17
(d) Miscellaneous Equipment .....	1103.17
(e) Membrane Curing Equipment .....	1101.09(c)

**CONSTRUCTION REQUIREMENTS**

**354.04 General.** The methods used in performing the following items of work shall be according to the requirements shown in the Articles listed below. The use of slip form methods for base course widening will be permitted at the option of the Contractor.

Item	Article/Section
(a) Removing Forms .....	420.11
(b) Temperature Control for Placement .....	1020.14
(c) Opening and Keeping Road Open to Traffic .....	701.17(c)(5)

**354.05 Subgrade.** The subgrade shall be prepared according to Article 420.04, except as follows.

- (a) The subgrade excavation shall be to the required depth for at least the full width of the proposed base course widening prior to placing the concrete. Excavation of the subgrade shall be as specified in Article 202.06.
- (b) The subgrade shall be rolled with a roller of a type approved by the Engineer. It shall be not less than 12 in. (300 mm) in width and shall weigh from 50 to 100 lb/in. (9 to 18 N/mm) of width of the roller.
- (c) Truck mixers or trucks will be permitted on the finished subgrade when approved by the Engineer. Approval will be withdrawn if rutting develops in the subgrade or subbase which reduces the plan thickness of the base course.

**354.06 Constructing Without Forms.** If the base course widening is constructed without forms, the following requirements shall apply.

- (a) The concrete shall be placed on the subgrade in a manner which will not cause segregation and which will meet the approval of the Engineer. It shall be struck off to the required elevation and properly consolidated. Consolidation shall be obtained by the use of internal vibration and by a mechanical surface vibrator or tamper, or one or more oscillating screeds. After the concrete has been consolidated, the surface of the concrete shall be finished by means of a metal plate. The plate shall be the full width of the widening and shall have a length of not less than 3 ft (1 m). The plate shall exert sufficient pressure on the concrete to produce a smooth and even surface.

Art. 354.06      Portland Cement Concrete Base Course Widening

- (b) The outer edge of the base course widening shall be supported for its full depth during the placing, consolidating, and finishing of the concrete by a vertical slip form and thereafter by earth banked against the edge, except that if the consistency and consolidation of the concrete and the equipment and method used are such that the concrete will retain its form satisfactorily, the earth support may be omitted.
- (c) The device used to construct the base course widening shall be guided by the edge of the existing pavement, and it shall ride exclusively on the existing pavement.

**354.07 Constructing With Forms.** If the base course widening is constructed with forms, the following requirements shall apply.

- (a) Forms and Form Setting. Forms and form setting shall be according to the requirements of Article 420.06, except a mechanical form tamper will not be required.
- (b) Placing Concrete. Concrete shall be placed according to Article 420.07, except that a mechanical concrete spreader will not be required. Spreading with shovels will be permitted. The base course widening may be struck off and consolidated by any of the three methods listed in Article 420.09(a). The concrete adjacent to the side form and the existing pavement shall be compacted with a vibrator inserted into the concrete and worked along the entire length of the side form and the existing pavement before the finishing operations are started.
- (c) Final Strike Off and Finishing. The concrete shall be finished to an even and uniform surface by the use of hand floats or other approved methods.

**354.08 Reserved.**

**354.09 Tolerance in Thickness.** The concrete base course widening shall be constructed to the thickness shown on the plans. Determination of concrete base course thickness and requirements relative to deficient thickness shall be as provided in Article 407.10, except as follows.

- (a) The width of a unit shall be the width of the concrete base course widening along one edge of the existing pavement.
- (b) Edge thickness may be measured instead of measuring the thickness at cored points. If edge thickness measurements are used, it shall be understood that references to cores and thickness at cored points will be applicable; and that the thickness of a unit will be determined in the same manner as would be done if the thickness had been measured at core points.

**354.10 Backfill at Edge.** Within 24 hours after completion of the base course widening, the remaining portion of the widening trench shall be backfilled as specified in Article 202.06. Prior to opening the base course widening to traffic, the Contractor shall compact the earth backfill adjacent to the base course. Compaction shall be obtained with a pneumatic-tired roller, to the satisfaction of the Engineer.

**354.11 Earth Shoulders.** At locations where no provisions have been made for the repair or improvement of the earth shoulders, they shall be left in as good a condition as they were before work was started. Such work as the Contractor may have to perform to meet this requirement shall be performed at no additional cost to the Department.

**354.12 Method of Measurement.** Portland cement concrete base course widening will be measured for payment according to Article 353.12.

**354.13 Basis of Payment.** Where the Department requires that portland cement concrete be used, this work will be paid for at the contract unit prices per square yard (square meter) for PORTLAND CEMENT CONCRETE BASE COURSE WIDENING and HIGH-EARLY-STRENGTH PORTLAND CEMENT CONCRETE BASE COURSE WIDENING, each of the thickness specified.

When the Contractor has the option of using either portland cement concrete or HMA according to Section 356, the work will be paid for at the contract unit price per square yard (square meter) for BASE COURSE WIDENING, of the thickness specified.

## SECTION 355. HOT-MIX ASPHALT BASE COURSE

**355.01 Description.** This work shall consist of constructing hot-mix asphalt (HMA) base course on a prepared subgrade.

**355.02 Materials.** Materials shall be according to Section 1030.

The mixture composition used shall be IL-25.0 or IL-19.0.

**355.03 Equipment.** Equipment shall be according to Article 406.03.

## CONSTRUCTION REQUIREMENTS

**355.04 Subgrade.** The subgrade shall be prepared according to Section 301, except Articles 301.05 and 301.06 will not apply, or according to Section 302 when soil modification is used.

**355.05 Placing.** HMA base course shall be placed according to Article 407.06 and the following.

- (a) The top lift thickness shall be 2 1/4 in. (60 mm) for mixture composition IL-19.0 or 3 in. (75 mm) for mixture composition IL-25.0.
- (b) When placing HMA base course adjacent to an existing pavement, the exposed edge of the existing pavement shall be cleaned of loose material to the satisfaction of the Engineer.

**355.06 Compaction.** The HMA base course shall be compacted according to Article 406.07.

**355.07 Hauling.** Hauling on newly placed HMA base course shall be according to Article 407.08.

**355.08 Surface Test.** The completed base course will be tested for trueness in each wheel lane by means of a 16 ft (5 m) straightedge placed parallel to the centerline of the pavement, parallel to the grade line and touching the surface. Surface variations of the base measured from the base of the straightedge to the surface of the pavement shall not exceed 3/8 in. (10 mm). Areas which have variations exceeding 3/8 in. in 16 ft (10 mm in 5 m) shall be corrected as directed by the Engineer.

**355.09 Tolerance in Thickness.** The base course shall be constructed to the thickness shown on the plans. Determination of the base course thickness will be according to Article 407.10.

**355.10 Method of Measurement.** HMA base course will be measured for payment according to the requirements of Article 353.12.

**355.11 Basis of Payment.** This work will be paid for at the contract unit price per square yard (square meter) for HOT-MIX ASPHALT BASE COURSE, of the thickness specified.

## **SECTION 356. HOT-MIX ASPHALT BASE COURSE WIDENING**

**356.01 Description.** This work shall consist of widening existing pavement with a hot-mix asphalt (HMA) base course widening not exceeding 6 ft (1.8 m).

**356.02 Materials.** Materials shall be according to Article 355.02.

**356.03 Equipment.** Equipment shall be according to Article 406.03. A mechanical spreader meeting the approval of the Engineer shall be used to place the HMA.

## **CONSTRUCTION REQUIREMENTS**

**356.04 Subgrade.** The material adjacent to the edge of the existing pavement shall be excavated for the full width required and to the required depth according to Section 202.

The subgrade shall be prepared according to Section 301, except Articles 301.05 and 301.06 will not apply.

The completed subgrade shall be compacted according to Article 354.05(b).

**356.05 Placing.** The HMA base course widening shall be placed according to Article 406.06, except for the following.

- (a) Prior to placing the HMA, the exposed edge of all existing pavement shall be cleaned of loose material to the satisfaction of the Engineer.

- (b) The HMA shall be placed in two or more lifts, subject to the lift thickness requirements of Article 406.06(d), as necessary to obtain the required density. A minimum of two rollers will be required. While compacting the top lift, the rollers shall be kept off the edge of the existing pavement.
- (c) Only one lift of HMA shall be placed in a day, regardless of its thickness, unless otherwise authorized by the Engineer. The maximum lift thickness shall be 6 in. (150 mm).

**356.06 Compaction.** The HMA base course widening shall be compacted according to Article 406.07.

**356.07 Tolerance in Thickness.** Determination of HMA base course widening thickness and requirements relative to deficient thickness will be according to Article 354.09.

**356.08 Backfill at Edge of Widening.** Backfilling at the edge of widening shall be performed as specified in Article 354.10.

**356.09 Earth Shoulders.** Earth shoulders shall be constructed according to Article 354.11.

**356.10 Method of Measurement.** HMA base course widening will be measured for payment according to Article 353.12.

**356.11 Basis of Payment.** Where the Department requires that HMA be used, this work will be paid for at the contract unit price per square yard (square meter) for HOT-MIX ASPHALT BASE COURSE WIDENING, of the thickness specified.

When the Contractor has the option of using either portland cement concrete as outlined in Section 354 or HMA according to Section 356, the work will be paid for at the contract unit price per square yard (square meter) for BASE COURSE WIDENING, of the thickness specified.

SECTION 357. POZZOLANIC STABILIZED BASE COURSE

**357.01 Description.** This work shall consist of constructing pozzolan stabilized base course.

**357.02 Materials.** Materials shall be according to Article 312.16 and the following.

Item	Article/Section
(a) Hot-Poured Joint Sealer .....	1050.02

**357.03 Equipment.** Equipment shall be according to Article 312.17 and the following.

- (a) Heating Equipment for Joint Sealant (Note 1)

Note 1. The heating equipment shall be of an indirect heating type with positive temperature control, mechanical agitation, and recirculating pump.

CONSTRUCTION REQUIREMENTS

**357.04 General.** The requirements for constructing pozzolan stabilized base course shall be according to Articles 312.18 - 312.23. References in these Articles to subbase and pozzolan stabilized mixture shall be construed to include base course and pozzolan stabilized base course, respectively. The subgrade shall be prepared according to Section 301, except Articles 301.05 and 301.06 will not apply.

In addition to the requirements of Article 312.23, transverse joints shall be constructed full plan width of the completed base course and sealed with hot-poured joint sealer. When base course is constructed adjacent to existing pavement, this joint will not be required. Joints shall be located at spacings of 30 ft (9 m) perpendicular to the centerline. Construction and sealing of the joints shall be performed as shown on the detail drawing included in the plans or as directed by the Engineer.

The base course portion of the joint shall be cut within 72 hours of base course compaction. This portion may be cut separately or in conjunction with the surface course portion if the 72 hour requirement can be met. The location of the joint in the surface portion shall not vary by more than 3/16 in. (5 mm) from the location of the joint in the base course.

Sealing of the surface course joints shall be performed according to Article 420.12, except that sealing shall commence immediately upon sawing of the joint.

The finished base course may be opened to local traffic 36 hours after the finishing operation unless otherwise directed by the Engineer, and to all traffic after placement of surface course.

Contraction joints shall be established in all base removed and replaced over 30 ft (9 m) in length.

**357.05 Tolerance in Thickness.** Tolerance in pozzolanic stabilized base course thickness shall be as specified in Article 352.17.

**357.06 Method of Measurement.** This work will be measured for payment as follows.

- (a) Contract Quantities. The requirements for the use of contract quantities shall conform to Article 202.07(a).
- (b) Measured Quantities. Pozzolanic stabilized base course of the thickness specified will be measured for payment in place and the area computed in square yards (square meters). The width for measurement will be the width of the top of the base course as shown on the plans or as directed by the Engineer. The liquid asphalt for the curing coat, any sand required, and the construction and sealing of contraction joints will not be measured for payment, but shall be considered as included in the contract unit price bid for pozzolanic stabilized base course.

**357.07 Basis of Payment.** This work will be paid for at the unit price per square yard (square meter) for POZZOLANIC STABILIZED BASE COURSE, of the thickness specified.

## SECTION 358. REPAIR AND PREPARATION OF BASE COURSE

**358.01 Description.** This work shall consist of the repair and preparation of existing surfaces, which are to be used as bases for the various types of surface courses.

**358.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate .....	1004.04

**358.03 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Pneumatic-Tired Rollers .....	1101.01
(b) Mechanical Sweeper .....	1101.03

## CONSTRUCTION REQUIREMENTS

**358.04 Aggregate Bases.** All loose materials on the surface of the proposed base course which are of such size, gradation, and quality that they can be utilized, shall be bladed to the shoulders and left in windrows together with any material already in windrows or stockpiles. All such materials shall be incorporated in the work or disposed of as directed by the Engineer. The repair and preparation of newly



constructed bases shall not be undertaken until it has been opened to traffic for a period of not less than ten days.

- (a) Repairs. All failures (potholes, deep depressions, or ruts) occurring in the existing surface to be used as the base, shall be repaired by scarifying, removing all foreign material, and reshaping. If additional material is needed to bring the surface to the required cross section, CA 6 aggregate shall be used. The repaired areas shall then be compacted thoroughly by means of a pneumatic-tired roller or a hand tamper as directed by the Engineer. If the moisture content of the aggregate is such that compaction satisfactory to the Engineer cannot be obtained, water shall be added.
- (b) Preparation. After the repairs have been made in the base course, any area having ruts, depressions, corrugations, excessive crown, or loose material shall be brought to a smooth grade and proper crown by repeatedly wetting with water applied by means of a sprinkler, blading with a road grader or multiple blade maintainer, and rolling with a pneumatic-tired roller. The base course shall be bladed lightly to such a depth that sufficient material will be obtained to true up the surface of the base course. During the smoothing operations, the roadbed from the edges of the base to the shoulder lines shall be bladed to a smooth uniform slope so that the surface will drain and not impound water.

After the surface of the base course has been brought to a smooth grade and proper crown, it shall be compacted by repeated wetting and rolling with a pneumatic-tired roller for a period of not less than two days. During this time, the surface shall be kept in a damp condition. Before a prime coat is applied, the base shall be surface dry, but at no time shall the period of drying be less than 24 hours. When required by the Engineer, the base course shall be swept with a mechanical sweeper or hand brooms before a prime coat is applied. The sweeping shall be continued until all dust, mud and foreign material are removed. Traffic shall not be allowed upon the prepared base course after the final sprinkling, or, if a bituminous prime coat has been applied, until the Engineer has approved the penetration of the prime coat.

**358.05 Old Bituminous, Brick, and Concrete.** Repair of old bituminous, brick, and concrete bases shall be as follows.

- (a) Repair. All loose and defective material shall be removed from all holes, ruts, or depressions in the existing surface. These areas shall then be filled as provided in the contract.
- (b) Preparation. After the base course has been patched and permitted to cure, it shall be cleaned by means of a mechanical sweeper, hand brooms, flushing with water, or by other approved methods. Special care shall be taken to clean the surface of the base course adjacent to the edges, so that the full width of the surface to be treated will be clean. The surface of the base course shall be clean and dry when the surface course is placed.

**358.06 Method of Measurement.** This work will be measured for payment as follows.

- (a) **Contract Quantities.** The requirement for use of contract quantities shall be according to Article 202.07(a).
- (b) **Measured Quantities.** The work in connection with the repair and preparation of bases, except materials, will be measured for payment in place and the area computed in square yards (square meters).

If additional material is required for the repair of aggregate bases, it will be measured for payment in tons (metric tons) according to the requirements of Article 311.08(b).

If additional material is required for the repair of old bituminous, brick, or concrete bases, it will be measured for payment as provided for in the contract.

**358.07 Basis of Payment.** The work in connection with the repair and preparation of bases, except materials, will be paid for at the contract unit price per square yard (square meter) for PREPARATION OF BASE.

Additional material required for the repair of aggregate bases, will be paid for at the contract unit price per ton (metric ton) for AGGREGATE BASE REPAIR.

When the contract does not contain a unit price for the material required for the repair of any type base, it will be paid for according to Article 109.04.